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ABSTRACT

The objectives of the report on underemployment are to define underemployment precisely and to explore some implications of that definition, to identify the significant causes of underemployment as defined, to investigate measurement issues related to the definition, and to make recommendations on the basis of the findings that will assist in policy decisions aimed at reducing underemployment. Chapter 1 provides the rationale and objectives of the study. Chapter 2 discusses labor markets, human capital, and underemployment. Chapter 3 details a comprehensive definition of underemployment--a definition which focuses on the degree of skill utilization in work rather than on unemployment. Chapter 4 seeks to identify and discuss some probable causes of underemployment as defined in the previous chapter. Chapter 5 examines alternative means of estimating the level and character of underemployment as defined in the study. Chapter 6 provides general, empirically-oriented recommendations, and some additional suggestions which are education policy-oriented, for policy action aimed at reducing the underemployment of human resources. An overview of Project TALENT, a nine-page bibliography, and a description of the Pennsylvania State University's Institute for Research on Human Resources and a list of its publications conclude the document. (NH)

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FINAL REPORT

APR 02 1975

UNDEREMPLOYMENT: DEFINITION, CAUSES, AND MEASUREMENT

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

by

Gerald P. Glyde
David L. Snyder
Anthony R. Stemberger

Prepared for

National Institute of Education
U. S. Department of Health, Education and Welfare

NIE Contract No. NIE C-74-0137

Institute for Research on Human Resources
The Pennsylvania State University
University Park, Pennsylvania 16802

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CHAPTER 1

INTRODUCTION: THE RATIONALE AND OBJECTIVES OF THE STUDY

Rationale of the Study

At the time of this writing, most individuals are well aware of, and continually reminded of, the need for efficient use of natural resources. Just as important is the need for efficient use of our human resources. This report is concerned with the latter issue. The efficient use of human resources can be interpreted broadly as a condition where jobs are provided for those individuals who want them; where jobs utilize the abilities, education, and training of individuals; and where jobs provide workers with satisfaction in their labors. This study focuses on the problem of the underutilization of human resources in employment. Although we approach the problem from the economist's viewpoint, which often appears abstract, our underlying aim is to seek information to promote the efficient use of human resources as defined above.

The underutilization of human resources occurs in diverse forms, however, two classifications are relevant for our purposes. First, underutilization may occur as a result of unemployment; that is, individuals are not working, but they are available and are actively seeking work.[1] Second, underutilization can occur in employment in the

---

[1] Individuals may also be "discouraged" and hence desire work but do not actively seek work.

case of individuals who work part-time but want to work full-time or in the case of workers whose skills are underutilized in the jobs that they perform (that is, they are "overtrained" or "overeducated"). In this study we are concerned with the last of these types of underutilization in employment; that is, we focus on the quality of work in contrast to the quantity of work. Underutilization with respect to quantity of work is the focus of current unemployment statistics. There is a paucity of information regarding underutilization of labor in employment, or on what is called underemployment.

A legitimate question might be raised here. Why study underemployment when our current problem is one of unemployment? In answer to this question we suggest four responses: (1) Although the current rate of unemployment is high (the December 1974 rate was 7.1 percent), we expect that a return to lower rates is likely, and therefore efficient utilization of labor in employment will be of more concern. (2) Perhaps a more compelling reason is that unemployment and underemployment are closely related in a dynamic labor market. More efficient use of human resources in employment means improved productivity, lower unit costs of production, improved wages, more expenditures, and increased output, other factors the same. In short, less underemployment means less unemployment and an improved trade-off between unemployment and inflation. (3) In a relative sense unemployment represents a more serious problem than underemployment. It is perhaps better to have "some" job than "no" job (ignoring the welfare option). Yet in absolute terms, underemployment may represent more of a material loss to the economy than

unemployment.[2] In order to determine relative magnitudes, we need more information on the extent of underemployment. (4) Another rationale for investigating underemployment is that billions of public and private dollars are expended on education, and the educational attainment of the labor force is rising. We do not know how well this education is being utilized. Are public expenditures on education a subsidy for the consumption of education rather than an investment in human resources which provides a return to individuals and society in excess of the costs? Are particular groups less able to utilize their educational skills than others?

Researchers in the area of human resources recognize the need for going beyond the concept of unemployment, and it is increasingly clear that underemployment will be a source of continuing investigation. The following quotes express this need:

> The Committee hopes that some exploratory work will be undertaken into the possibility of developing even partial measures of underemployment.[3]
>
> Indeed, in all countries--rich and poor alike--the study and reporting of underemployment as a measure of the quality

---

[2]Unemployment problems necessarily take the first priority at any point in time. However, since in normal circumstances there are twenty times as many people employed as there are unemployed, underutilization in employment may result in more lost output than the output loss associated with unemployment. This is an empirical question.

[3]U. S. President's Committee to Appraise Employment and Unemployment Statistics, Measuring Employment and Unemployment (Washington: U. S. Government Printing Office, 1962), p. 59.

> of working life is bound to become increasingly important to the formation of public policy.[4]
>
> My thesis is that the now orthodox preoccupation with the overall rate of measured unemployment is no longer very useful for making of employment policy.[5]
>
> There is a recognized need to improve the measurement of each of the several facets which affect the adequacy of employment for individuals.[6]

Objectives of the Study

Underemployment in this study is used in the "overtrained" sense; that is, workers' education exceeds the technical requirements of their jobs. Underemployment has been used in numerous contexts in the literature, and confusion often arises as to how authors are using the term. When reference is made to underemployment in the "overtrained" sense, questions such as "Underemployed relative to whom?" are seldom asked. Indeed a number of conceptual issues arise as one begins to dissect this definition of underemployment; thus, exploration of the "overtrained" definition of underemployment is a major part of this study.

More specifically the objectives of this report are: (1) to define underemployment in a precise way and to explore some of the

---

[4]Bennet Harrison, "Education and Underemployment in the Urban Ghetto," American Economic Review 62 (December 1972): p. 797.

[5]George H. Hildebrand, "The Declining Importance of the General Unemployment Rate for Future Employment Policy," Industrial Relations Research Association, Annual Research Volume, 1973, p. 65.

[6]Deborah Pisetzner Klein, "Exploring the Adequacy of Employment," Monthly Labor Review 96 (October 1973): p. 8.

implications of that definition; (2) to identify the significant causes of underemployment as we have defined it; (3) to investigate measurement issues related to our definition; and (4) to make recommendations on the basis of our findings that will assist in policy decisions aimed at reducing underemployment.

To illustrate where underutilization occurs, the report begins with a brief model of the labor market. Following that discussion, the study proceeds to examine objectives (1) to (4) listed above.

The underemployment issue is not a tidy one. Many questions are raised in this study--questions for which answers are not readily available. Perhaps this is the nature of most social science research. Hopefully, the discussion provided here will encourage others who use the term "underemployment" to consider more closely just what they mean by it. An additional hope is that this study will encourage others to work toward a measure of underemployment. We predict that the need for such a measure will become increasingly important in monitoring the labor market and in achieving a variety of public policy objectives.

CHAPTER 2

LABOR MARKETS, HUMAN CAPITAL, AND UNDEREMPLOYMENT

Introduction

This chapter provides a background discussion of (1) the underutilization of human resources in labor markets, (2) the human capital concept, and (3) the multiple usage of the appellation "underemployment."

A basic understanding of how the labor market works and where underutilization of human resources occurs is required before we discuss our definition of underemployment and its causes (Chapters 3 and 4). A description of the human capital concept is necessary because the theory plays a central role in both our definition of underemployment and the measurement discussion provided in Chapter 6. An overview of forms of underutilization of human resources, which are given the appellation "underemployment," is required before our definition can be placed in perspective. This discussion will also be helpful in noting what is excluded from our definition.

Underutilization of Human Resources in Labor Markets

The process whereby human resources are underutilized can be described with the use of two simple schematics, one being a subset of the other. Figure 1 identifies and portrays the various important stocks and flows in the labor market. For our purposes, this model can be used to illustrate underutilization of labor outside of employment.

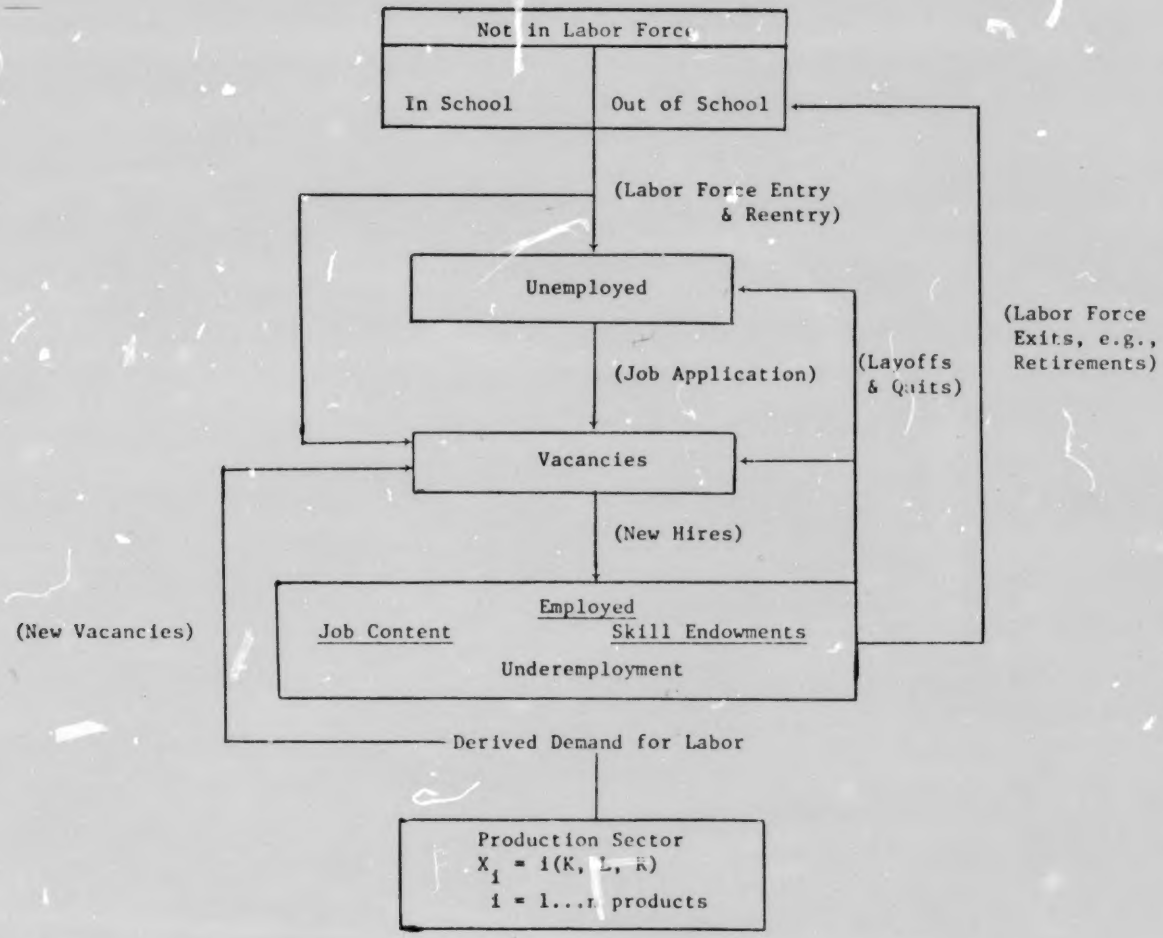

FIGURE 1. Labor Market Model

The second schematic, shown in Figure 2, is useful in illustrating the manner in which human resources are underutilized within employment.

Sources of Underutilization Outside of Employment

Figure 1 provides a simple illustration of the structure of the labor market. The boxes represent stocks--for example, the unemployed, vacancies, and the employed. The arrows represent flows in the labor market--for example, flows of vacancies, quits, layoffs, and retirements. Perhaps the most important aspect of this simple model is that it illustrates the fluid nature of the labor market, the interdependence among labor market sectors, and the potential for underutilization.

The Fluid Nature of the Labor Market. Individuals continuously flow into the labor market, a major proportion of them having just completed their education. Competing for new vacancies are workers who have quit their jobs or have been laid off but who are not new entrants to the labor market. In addition, other individuals (such as housewives) continuously enter, exit, and reenter the labor market to provide additional competition for available vacancies.

Individuals entering the labor market for the first time, those reentering, and workers who have quit or been laid off are heterogeneous in skill and aspiration. They possess different endowments of wealth that enable them to bear more or less of the search costs related to the job hunt. Given the continuous flow of diverse workers into the unemployment box of Figure 1, it is clear that there must be either an

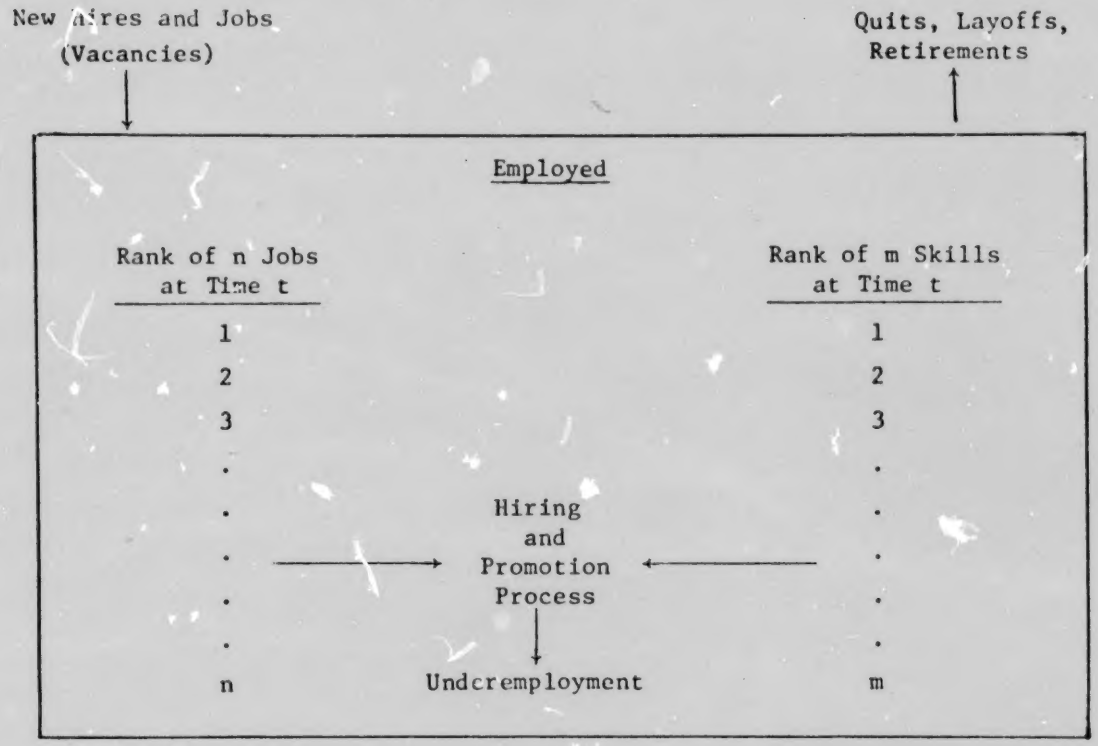

FIGURE 2. Hypothetical Ranking of Jobs (by Educational Requirements) and Workers (by Skill Level)

offsetting flow of diverse job vacancies or an increase in the unemployment rate (providing people do not drop out of the labor force).[1]

The Interdependence Among Labor Market Sectors. The flows of workers and the size of the stocks are not independent of one another. For example, new vacancies which emanate from the production or demand side of the market result in new entries into the labor force in reaction to new opportunities. In addition, increased quits and hires as well as reduced layoffs are the result of additional vacancies. Yet the demand for labor is a derived demand--derived from the demand for goods and services. The source of the demand for goods and services is, in part, household consumption expenditure which in turn derives in large measure from wages and salaries. Wages come from jobs which initally appear as of vacancies. This simple example illustrates the dynamics and interdependencies within the labor market.[2] Where the current labor force entrant ends up in the job hierarchy will depend to a large extent on current stocks and flows. If one is fortunate enough to enter a skill or occupation in which the stock is low relative to demand and if flows are small, the job taken at entry and the rate of promotion will

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[1]The unemployment rate is defined as the number of unemployed (those people actively seeking and available for work but not currently working) over the employed (those working one hour or more, for pay, in the survey week) plus the unemployed times 100. The labor force is the sum of the employed plus unemployed (16 years or older). See U.S. Bureau of Labor Statistics, How the Government Measures Unemployment, Report 418 (Washington, D. C.: Government Printing Office, 1973).

[2]For a more complete discussion of the dynamics of the labor market, see Charles C. Holt, "Job Search, Phillips' Wage Relation, and Union Influence: Theory and Evidence," in Edmund S. Phelps et al., Micro-economic Foundations of Employment and Inflation Theory, (New York: W. W. Norton, 1970), pp. 53-123.

be quite different from those of the entrant who faces a large existing stock of competitors for promotions as well as stiff competition for entry level vacancies due to a large flow. Heavy competition, of course, means more unemployment (other factors the same) as well as less satisfactory jobs on the average, for those who do secure positions.

The Potential for Underutilization. If workers and jobs were relatively homogeneous, if information regarding vacancies and skills of underemployed workers widespread and free, if adjustment were rapid and costless, the unemployment box in Figure 1 would be insignificant in size. However, the job content of vacancies varies widely and worker vacancies are spacially diverse. Labor market information is not free, and the gathering of it, both by individuals and employers, is expensive. Adjustment or labor mobility is often sluggish; risk and uncertainty are the rule, not the exception.

Given the fluidity of the labor market, the interdependencies among its segments, and the barriers to smooth and rapid matching of workers with vacancies, it is not surprising that considerable underutilization results. Workers who quit or are laid off do not find alternative work immediately. Statistics on the duration of unemployment testify to this fact.[3] New and reentering workers to the labor force may not find work upon entry, and the result again is unemployment. Some individuals who seek work and do not find it after considerable effort become discouraged and drop out of the labor force (and the unemployment statistics).

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[3] Manpower Report of the President (Washington, D. C.: U.S. Government Printing Office, 1974), Table A-20, p. 153.

Unemployment is the usual and most frequently cited source of underutilization of human resources. At least our labor force statistics are biased in this direction.[4] Emphasis is on measuring underutilization of human resources as a problem of the quantity or availability of work rather than the quality of work. Yet, given imperfections and barriers in the labor market and the size of the employed force (approximately 85 million)[5] compared to the unemployed labor force (6 million and perhaps 1 million discouraged workers), underutilization within employment may represent much more lost output and frustration in an absolute sense than does unemployment.[6] More subtle instances of the underutilization of human resources, which occur because workers' skills exceed their job requirements, are illustrated below.

Sources of Underutilization in Employment

Given Figure 1, a usual assumption is that once a status of employment is reached, workers have reached their goal. This is not necessarily the case. Figure 2 provides a clearer look at the employment box of Figure 1 from which underutilization of labor in employment can be viewed.

Conceptually, we can think of a hierarchy of both jobs i(i = 1... n) and workers j(j = 1... m) and assume that these hierarchies

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[4] Ibid., pp. 121-253.

[5] Ibid., Table A-1, p. 127.

[6] This statement is not meant to belittle the problem of unemployment, but rather to point out that underutilization occurs elsewhere in the labor force.

are ranked from top to bottom according to technical skill requirements or job content on the demand (employment) side and educational or skill attainment on the supply (workers) side. Note that these hierarchies are never stable; for example, the job hierarchy is in a continuous state of flux as new vacancies appear and other positions disappear. The skill mix is also dynamic in that workers are entering, exiting, and reentering the labor market continually and flowing from employment to unemployment and back to employment, thus bringing a different distribution of skills into the labor market juxtaposed with the hierarchy of jobs. Despite this fluidity in the labor market, it is not unreasonable to consider the hierarchies of jobs and skills to be reasonably constant at a specific point in time.

In a competitive, frictionless world, the optimal situation exists if skills match perfectly with technical job requirements or job content. To the extent that this "best" match does not exist, underutilization of labor results.

A perfect matching process, of course, is neither possible nor optimal even if it were possible to obtain. It is not optimal because the costs of attainment would be exorbitant. Long before the perfect match was reached, marginal expenditures to approach that utopian position would far exceed any incremental benefits of the move toward it. The costs to which we refer are largely information or search costs and the costs of adjustment or mobility. For example, employers would need to have complete updated information on the available skills of workers in the labor market and would have to be instantly notified of changes.

Only a moment's reflection makes it clear that measuring skills in itself, aside from monitoring change, is a most difficult task. How would one identify education, its formal contribution as opposed to on-the-job training or informal education, and separate this process from socio-economic background and its effect on skill? In addition, there is the controversy over the role innate ability plays aside from schooling or any other form of nurture.

The same problem of measurement occurs when one tries to identify the technical requirements of jobs. It is difficult enough to work with broad occupational categories and identify basic skill components; to approach an ideal match, detailed task analysis would be necessary, changes in task requirements would have to be transferred to the labor market side immediately, and those individuals receiving training would have to adjust their programs.

The fact that it is not desirable to work toward a perfect matching process does not imply that considerable expenditures to improve the link between job requirements and skills of workers are not beneficial. In order to accomplish an improved match, more information is required on the demand side, i.e., skill content of jobs or the relationship among skill requirements of families of jobs or occupational clusters.[7] To obtain accurate information, it would be necessary to distinguish between the technical requirements of job tasks and requirements that

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[7] On this topic see James G. Scoville, Manpower and Occupational Analysis: Concepts and Measurements (Lexington, Mass.: Lexington Books, 1972). Also see Scoville's The Job Content of the U.S. Economy, 1940-1970 (New York: McGraw-Hill Book Company, 1969).

employers say are necessary for the performance of particular jobs.[8] On the supply side of the market, we need more information on what Blaug has called "nature and nurture,"[9] the former reflecting innate ability and the latter reflecting family influence and quality and quantity of schooling.

Demand and supply information such as suggested above is necessary for the ideal measure of the extent of underemployment. In addition, more information is required on the actual matching process between demand for and supply of labor. That is, there is much to be learned about the hiring and promotion process, the process by which workers (skills) are matched with jobs (required skills).

Given that labor market information for both employers and workers is imperfect, the hiring and promotion process which links the supply and demand sides of the labor market is very imprecise. Employers incur considerable risk and uncertainty when hiring a job applicant. In the first place, internal manpower planning only loosely defines job responsibilities within the firm. In addition, identifying the skills, aspirations, and goals of workers is a most difficult task. Risk and uncertainty are also the rule for the job applicant. He learns about job content on the job, not prior to getting the job.

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[8] Ivar Berg, Education and Jobs: The Great Training Robbery (Boston: Beacon Press, 1971).

[9] Mark Blaug, The Economics of Education (Baltimore: Penguin Books, 1970), Chapter 2.

In short, employers and applicants need ex ante information but receive ex post information. Although selection of occupation and education streams is a function of factors other than demand and supply in the market place, it is clear that individuals do react, albeit with a lag, to market conditions. Nevertheless, given the rather poor information that is available about vocational opportunity and the rather tenuous way in which existing information is transmitted, the process of decision making clearly involves a significant gamble. The result of inadequate labor market information is that skills of workers are imperfectly matched with job requirements. What we refer to as underemployment occurs when workers' skills exceed the requirements of their jobs.

To the extent that those investing in skills or human capital have imprecise information about vacancies which are generated from the production box as shown in Figure 1, there is bound to be a mismatch between the supply of skills and jobs. Technology is in a continuous state of flux which changes the manner in which products and services are produced and, therefore, the labor skills that are required. Note that labor is but one input in the production function, and inputs are in many respects substitutes for one another, albeit imperfect ones. The quantity and nature of labor demanded will depend not only on its price but also on the price and form of other inputs.

In short, given the dynamics of the production of goods and services and the production of the skill distribution of workers through human capital formation, it is not surprising that considerable mismatching occurs between jobs and workers. The main barriers

to overcoming the problem are inadequate information and high adjustment costs.

With the aid of Figures 1 and 2, we have shown that human resources may be underutilized in a number of ways, both within and outside of employment. It is important to note that underutilization in employment and unemployment are not independent of one another. A simple example will illustrate both the notion of underemployment and the interaction between it and unemployment. Suppose there are three jobs, X, Y, and Z, declining in order of productivity and skill requirements. In addition, suppose there are three individuals, A, B, and C, to fill the jobs. If A is better qualified for all three occupations than B or C, then A should be in job X. If B is better qualified than C for all three occupations, then B should be in job Y and C should be in job Z, where he has a "comparative advantage" over A and B. If A or B are in occupation Z, they are underemployed because they have an advantage in jobs X and Y, respectively. If there are two A's (in terms of ability) and one B and one C, but only three jobs, C will probably be excluded from job Z and one of the A's and B will be underemployed. This simple illustration shows how underemployment may occur and how it and unemployment interact. It also shows how changes in demand (number and quality of job vacancies) and supply (number and skill of workers) can influence the distribution of underemployment and unemployment.

Clearly, an important cause of underemployment is the manner in which people select their skill training or occupation. In addition, the extent of underemployment that workers experience will determine

the success of their educational investment, at least in monetary terms. The process whereby individuals invest in themselves and the manner in which we view returns to these investments are best explained through the notion of human capital.

Human Capital

For the purposes of this study, formal training and work experience are treated as the major components of human capital. This is a narrow definition of the concept. In its broadest sense, human capital refers to the resources that are embodied in persons and yield returns over time.[10] These resources are investments[11] insofar as they are expected to enhance future welfare; the durability of their effect contrasts the ephemeral effects of resources consumed for their immediate contribution to well-being. The returns associated with a human capital investment may be of a monetary or nonmonetary form and may accrue to both the individual and to society. Generally, the benefit streams are multidimensional. For example, taxonomies of the economic effects of education distinguish among:

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[10]The notion that capital is embodied in labor is not a new one; it was alluded to by Adam Smith in his Wealth of Nations (1776). More recently, the human capital concept has been developed by (among others) Gary Becker, Human Capital (New York: National Bureau of Economic Research, 1964); Theodore Schultz, "Investment in Human Capital," American Economic Review 51, pp. 1-17, (March 1961); and Lester Thurow, Investment in Human Capital (Belmont, California: Wadsworth Publishing Company, Inc., 1970).

[11]The investment component of human capital usually refers to the purchase of skill (training) rather than inherited skill or innate ability.

(1) Consumption effects, which refer to the psychic satisfaction gained by the process of learning. Thus, a given activity may have both consumption and investment dimensions.

(2) Productivity effects (or investment, pecuniary, or labor market effects), which refer to the impact of the skills and information acquired on labor market performance. These are generally regarded as the key considerations influencing individuals' decisions to invest in themselves. To the extent that an individual's economic status reflects the social value of his contribution to output, these represent a social as well as an individual benefit.

(3) Socialization effects, or the "better citizenship" qualities that may be instilled by schooling.

(4) Equity effects, or the role of education in realizing a more socially desirable distribution of income.

These last two considerations, which are external to the individual's investment decision, provide a significant part of the economic rationale for the public subsidies to schooling.

The present study focuses on the productivity effects of human capital, but, it should be borne in mind that these are apt to be incomplete measures of its benefits.[12] Investments in people increase

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[12]The productivity effects of a human capital investment are also the most measurable dimension of its impact. The key difficulty encountered in measuring productivity effects lies in controlling for other worker attributes that may influence labor market performance, such as innate ability, family background, etc.

productivity--the value of a worker's contribution to output or, more simply, earnings--in two ways: directly by affecting occupational attainment and indirectly by increasing employment security and the physical capacity for a more intensive work effort and a longer working life. Activities such as schooling or on-the-job training, which impart a set of skills of varying specificity, may be referred to as primary human capital investments. This label underlines the pivotal nature of such activities. They are generally undertaken prior to, or at the threshold of, entry to the labor market and at once reflect and delimit aspirations as to type and level of career objective.[13]

Activities such as migration and job search are secondary investments in the sense that they enhance the effectiveness of, and are less irreversible than, the primary investments.[14] This is not to underestimate the importance of secondary investments. In some instances, the two types of investments may be complementary. For example, the acquisition of training in a highly specialized skill may entail geographic relocation as a joint undertaking. Or, as in the case of unskilled migrant labor, the secondary investment--migration--may be the principal element of human capital.

Human resource investments, like investments in physical capital, have costs. By comparing the expected costs and returns associated with

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[13] In many cases it may be that a diploma or degree represents only a small "real skill" advantage. However, if these "credentials" are required for job entry, they are important for the job vistas they open up, regardless of their skill content.

[14] The irreversibility is a function of the size of the "sunk" cost (time) in the investment.

a project, an interest rate that equates the two streams may be calculated. This rate, known as the internal rate of return on the investment, provides a measure of its effectiveness (the higher the internal rate of return, the more favorable the comparison between the investment and alternative uses of funds).[15] At least from a conceptual viewpoint, a complete specification of the costs incurred by a human capital investment is generally less complicated than in the case of returns. For example, the private costs of enrollment in a formal

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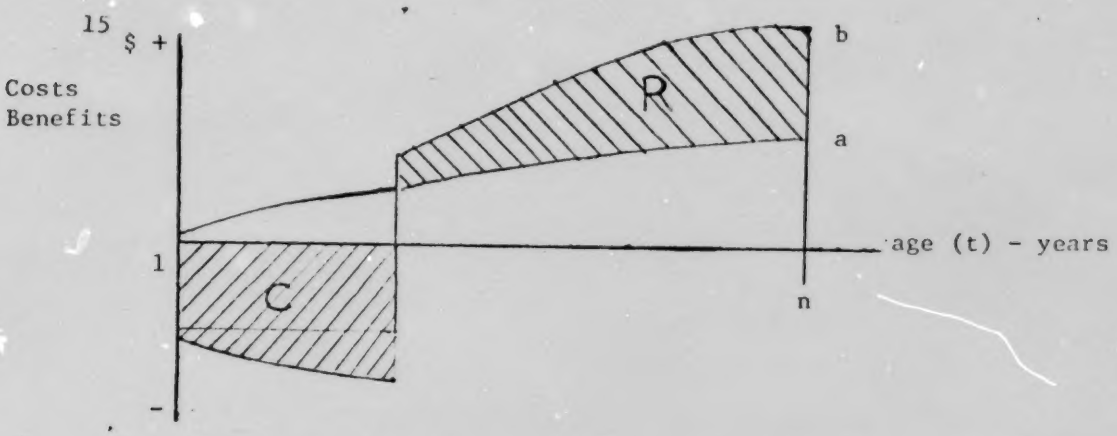

In the figure, b represents the age-earnings profile of an individual who undertook a human capital investment, and a is the age-earnings profile of an individual with the same productivity characteristics who did not undertake the investment in question. (By "productivity characteristics" we mean all attributes of a worker that have a functional economic relationship to work performance. Included are innate abilities and behavioral characteristics as well as formal training and work experience.) The first shaded area (C) denotes the costs of the human capital investment. The second shaded area (R) measures the returns associated with the investment. The greater R is relative to C, the greater the internal rate of return is.

In technical terms, the internal rate of return (r) is an interest rate that equates the present discounted value of the costs and the present discounted value of the returns associated with an investment. Let $B_t = (R_t - C_t)$ be the net benefits (costs) per period t, extending n years from period 1. The internal rate of return (r) is derived by solving the following equation for r.

$$\sum_{t=1}^{n} \frac{B_t}{(1+r)^t} = 0$$

educational or training program clearly consist of direct outlays on schooling, such as tuition, and the earnings foregone by withdrawal from the labor force.[16]

The evaluation of investments in people in terms traditionally applied to business investments lends itself to two interpretations. The weaker of the two interprets the approach as purely an analytic device. Here, the human capital concept provides a framework for assessing the effects of the investments but has no behavioral implications. In the more powerful interpretation, the human capital concept is the cornerstone of a theory that draws on behavior in the realm of business investment to explain expenditures on human capital. That is, individuals investing in themselves are assumed to be governed by essentially the same motives imputed to entrepreneurs in a market economy. Other things the same, funds will be allocated to those projects that are expected to yield the highest rates of return. A number of studies have substantiated the more modest hypothesis that decision making in this area tends to be economically rational. Students' choices of curricula at the university level have been found to be related to the state of occupational markets, and patterns of migration have conformed to those predicted by the theory.[17]

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[16]The social costs incurred by a human capital investment are its total resource costs. If, for example, an educational program receives public subsidies, its social costs will exceed its private costs. Since this report is concerned with explaining differences in the utilization and remuneration of individuals' investments in schooling and training, costs are defined in the private rather than the social sense.

[17]See Y. Weiss, "Investment in Graduate Education," American Economic Review 61 (December 1971): 833-852; R. Kilinov-Malul, "Enrollments in Higher Education as Related to Earnings," British Journal of Industrial Relations 9 (March 1971): 82-91; L. Sjaastad, "The Costs and Returns of Human Migration," Journal of Political Economy, Supplement (October 1962): 80-93.

Given the behavior postulated by this theory and a purely competitive economy,[18] the rate of return on human capital investments would tend toward a long-run equilibrium. Assume, for example, that there is an increase in the demand for an industry's output. Earnings for the mix of occupations in the industry would increase, and the rate of return on the human capital investments for the occupations concerned would be raised above the equilibrium level. In theory, this would initiate two offsetting changes. First, workers with substitutable skills would be drawn from other industries to the expanding industry. Second, the number of persons seeking training in the affected occupations would increase. This influx of new workers and the resulting competition for jobs would drive earnings and rates of return back to their equilibrium level.

In the real world, several sets of factors impede the movement of rates of return on human capital toward equilibrium. First, differences in the innate abilities of workers lead to earnings differentials among individuals with identical levels and types of training. Second, market imperfections act as barriers to both the full utilization of skills and equality in the rewards for similar work. These include inadequate information regarding employment opportunities, discrimination by employers on the basis of noneconomic characteristics of the work

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[18]The concept of a purely competitive economy is to the economist what a frictionless state is to an engineer or physicist. Among other things, it assumes that wages adjust instantaneously to changes in the supply of and demand for skills, that workers and employers have access to all relevant information, and that there are no barriers to the mobility of human and nonhuman resources.

force, imperfect employer information regarding workers' abilities, etc. Also significant are nonlabor market imperfections. For example, an effect of business monopolies is to raise artificially the value of labor's output; other things the same, equal skills and work will be more highly rewarded in monopolistic as opposed to competitive industries. The underemployment of individuals within skill groups will be referred to here as micro-underemployment, the type of underemployment emphasized in this report.

Whatever the immediate causes of occupational or macro-underemployment, the ultimate responsibility lies with limitations on the transferability of skills among jobs. Reductions in defense appropriations may initiate the underemployment and, in the extreme case, the unemployment of aerospace engineers, but it is the specificity of their skills that inhibits their shift to alternative engineering occupations. The cross-elasticity of demand among skills provides a conceptual measure of the interoccupational transferability of training and experience.[19] The underlying assumption is that the lower productivity resulting from a less than perfect matching of workers' skills to job requirements may be compensated for by reduced labor costs. As a final comment, it should be noted that the impact of both market imperfections and the limited substitutability of skills on underemployment is very much a function of

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[19]The cross-elasticity of demand between two skills, A and B, is the percentage change in the employment of A divided by the percentage change in the wages of B. If this coefficient is positive, then the skills are substitutable; if it is zero, then they are independent. Ideally, an occupational classification scheme intended for analyzing current stocks of human capital and forecasting future manpower requirements would be constructed on this concept.

aggregate economic conditions. Rapid growth and a tight labor market may be expected to go far toward countering their effects.

Multiple Usage of the Appellation "Underemployment"

One of the difficulties in discussing underemployment is that the term has been used in such diverse contexts. Because authors often are not explicit about what they mean by the term, confusion results.[20] Below we briefly describe a use of the term that is close to the one on which we focus in this paper. In addition, a number of other uses of the term "underemployment" are mentioned. There is no unique way to define underemployment, but when it is used, its meaning and implications should be clear. As we shall see, precision is not easy to obtain unless extensive qualifications are made.

The type of underemployment in which we are interested is consistent with the Gordon Committee's definition: "employment of persons at jobs that call for less than their highest level of skill and at wages less than those to which their skills, if fully utilized, would normally entitle them."[21] A number of problems arise with this definition. At

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[20]An example of imprecise usage, or perhaps loose usage, of the term "underemployment" is the following: "Individuals with aptitudes and ambitions exceeding those required by their jobs might well be considered underemployed." David C. Bjorkquist, "Technical Education for Underemployed," Vocational Guidance Quarterly 18 (June 1970): 264. The difficulties with such a definition, which is not an isolated use of the term, will become apparent when we discuss our definition in detail in the next chapter.

[21]U.S. President's Committee to Appraise Employment and Unemployment Statistics, Measuring Employment and Unemployment (Washington, D. C.: Government Printing Office, 1962), p. 58.

a minimum, extensive qualifications are necessary. For example, what does highest level of skill mean? Does it mean potential skill, current skill, or skill level reflected by past years of education completed? There is much room for different interpretations within this one definition of underemployment, and this is only one of many usages found in the literature.

Within considerably narrower bounds than the above definition, several attempts have been made in the United States to extend the usual measure of unemployment. These extensions include various types of underemployment (alternatively called subemployment) measures. Three basic components make up these underemployment, or subemployment, measures. The first component refers to part-time work where full-time work is desired by those individuals involved. A second type of underemployment refers to discouraged workers, that is, workers who have dropped out of the labor force and therefore are not counted officially as being unemployed but who would seek work if they thought it were available. The final component has to do with inadequacy of earnings in employment. These three components have been added to the regular unemployment statistics to provide an index which more truly reflects underutilization in the labor force.

The first measure of this sort appeared in 1966 when ghetto underemployment was the focus.[22] The latest measure of this kind of

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[22]W. Willard Wirtz, "A Report on Employment and Unemployment in Urban Slums and Ghettos: Memorandum for the President," December 23, 1966, in U. S. Congress, Senate Subcommittee on Employment, Manpower and Poverty, Comprehensive Manpower Reform, 92nd Congress, 2nd Session (Washington, D. C.: Government Printing Office, 1972).

underemployment is provided by Levitan and Taggart in what they call an employment-earnings inadequacy index. Their measure includes the regular measure of unemployment in addition to:

> discouraged workers who want jobs but are not looking because they think no work is available, lack the necessary experience or schooling, are too young or too old, or have other personal handicaps making them unattractive to employers;
>
> currently employed family heads and unrelated individuals whose earnings in the previous twelve months were inadequate to lift their households above the poverty threshold;
>
> other currently employed household heads earning less than a poverty income during the preceding year because of intermittent employment less than full-time work and/or low rates; and
>
> workers employed part-time during the survey week, not included in the previous category, who want full-time jobs but cannot find them, have been laid off during the survey week, or have some other economic impediment requiring part-time employment.[23]

This list illustrates what many people mean when they refer to underemployment. Although it presents a number of difficulties, measuring this form of underutilization in the labor force is much easier than measuring underemployment according to the Gordon Committee's definition.[24] The United States Department of Agriculture has used the notion of underemployment in another way.[25] The level of analysis in this case is the county.

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[23]Sar A. Levitan and Robert Taggart, III, Employment and Earnings Inadequacy: A New Social Indicator (Baltimore, Maryland: The Johns Hopkins University Press, 1974), p. 14.

[24]Deborah Pisetzner Klein, "Exploring the Adequacy of Employment," Monthly Labor Review 96 (October 1973): 7.

[25]Ronald E. Kampe and William A. Lindamood, Underemployment Estimates by County, Agriculture Economic Reprint #166 (Washington, D. C.: U.S. Department of Agriculture, Economic Research Service, 1960).

> The approach was to compare the reported county median income with an imputed county median income which reflected the earning capacity of the county labor force if county income were the same as for the national labor force with similar characteristics.[26]

This measure is a very crude one and appears to have been discontinued.

The International Labor Office (ILO) suggests three types of underemployment; visible, disguised, and potential underemployment.[27] The first is essentially the same as one component of the employment-earnings inadequacy index referred to above. Visible underemployment is said to exist when "persons in employment carry on their occupation for an abnormally short time having regard to the occupation, industry, or region when they seek or would be willing to accept additional work or a full-time job."[28] Disguised underemployment is defined as that "which affects persons who are employed in jobs that, having regard to their abilities and skill, have a low productivity and provide an abnormally low income, and who seek or would be willing to accept work in which conditions of employment are normal."[29] Potential underemployment is "characteristic of persons in employment from which they obtain a normal income having regard to their abilities and skill and whose work would be more effective if the general productivity of the establishment in which they work were raised to a given level consistent with

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[26] Ibid., p. 1.

[27] "The Measurement of Underemployment," International Labor Review 76 (October 1957): 349-366.

[28] Ibid., p. 355.

[29] Ibid., p. 356.

economic and social conditions in the region concerned."[30] The last two are not dissimilar and can be considered subsets of the Gordon Committee's definition given previously.

The definition of potential underemployment in this case raises a good point. Implicit in the definition is an excess supply of labor (a condition often characterizing less developed countries). The excess supply of labor exists in the sense that labor could be more productive if only there were more physical capital to work with. However, as Rottenberg points out, this statement is true of rich and poor countries alike.[31] In fact, it is true of all individuals--we could all be more productive with banks of computers at our sides and more information at our fingertips. Given the current stock of capital, however, we may not be considered underutilized. An excess supply, or underemployment, exists only if there is capital already available to combine more efficiently with the labor input. In terms of Figure 1, we must accept the current production function, i.e., the current technology levels and quantity of capital, skills, and number of workers and other resources. If we assume an infinite possibility to expand capital and technology which is not already in existence, everyone would be considered underemployed.

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[30] Ibid., p. 356.

[31] "It is not right to speak of an excess supply of labor in some industry, merely because fewer of them could do the same job, if only there were more capital." See Simon Rottenberg, "The Meaning of Excess Supply of Labor," Scottish Journal of Political Economy 8 (February 1961): 67.

There is another interpretation of potential underemployment in which upgrading (training) of individuals may be possible given the current production function. We discuss this aspect of potential underemployment in the next chapter.

Another definition which is conceptually unambiguous is the economists' definition of underemployment:

> Economic underemployment of labor exists when the real return which owners receive for the use of labor in a particular field of resource use is less than the real return which could be obtained for comparable resource service in other uses.[32]

In the above definition, "in other uses" refers to current alternative uses, that is, given the existing production function. This definition is more precise than the Gordon Committee's definition, but the latter is really an attempt to pragmatically approximate the former. The definition given above is useful in that it suggests a basis for measuring causes of underemployment, i.e., looking at real returns to labor or human capital.

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[32]Charles E. Bishop, "Underemployment in Southeastern Agriculture," Journal of Farm Economics 36 (May 1954): 258.

CHAPTER 3

UNDEREMPLOYMENT: A DEFINITION AND CLARIFICATION

Introduction

This chapter provides a comprehensive definition of underemployment, a definition which focuses on the degree of skill utilization in work rather than on unemployment. In short, we are concerned with one aspect of the quality of work in contrast to the usual concern for the quantity of work. Quality of work is assumed to be related, albeit in a restricted sense, to the rate of remuneration in work, other factors the same. In turn, the rate of pay in work is expected to reflect how well the individual's skills are utilized.[1] If he/she is overtrained relative to job requirements, pay will be less than if skills are used more fully on the job.

Quality of work is often thought of in terms of job satisfaction. The simple and reasonable assumption made here is that, other things the same, rational people's job satisfaction is positively related to their rate of pay. Therefore, if remuneration for a given bundle of skills is, on average, a reflection of the extent to which skills are utilized, worker job satisfaction and

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[1] This relationship is explained more fully below.

skill utilization are expected to be positively related. This view does not deny the importance of the many other complex determinants of rates of pay differentials or job satisfaction. The purpose of the above comments is simply to illustrate the link among skill utilization, rate of pay, and job satisfaction. The concept of underemployment discussed here is concerned primarily with skill utilization and remuneration in work.

As illustrated in the previous chapter, the term "underemployment" has been used in numerous contexts and often in a loose manner, particularly when reference is to underutilization of skills. This chapter is designed to provide a precise definition of underemployment and a detailed discussion of the numerous implications that are implicit in that definition. It is unrealistic to expect a definition of underemployment to internally provide answers to all of the issues it raises.

The implications are raised by clarification and expansion of key words used in the definition. This chapter, then, illustrates the numerous conceptual issues raised by a definition of underemployment. Perhaps the discussion provided here will encourage others who use the term to consider more closely just what they mean by it. Ambiguity in definition only compounds the problem of understanding the extent and nature of the underutilization of human resources.

Definition

Underemployment in this paper is defined as an involuntary employment condition where individuals are working in jobs, either part-time or full-time, in which their skills

(human capital), including formal (certified) training and work experience (uncertified training), are undervalued and/or technically underutilized.

Undervaluation is expected to be related to technical underutilization,[2] and the former may be expressed in relative terms as the rate of return on investment in human capital. The numeraire,[3] to permit a relative comparison, is the average rate of return on human capital for individuals in the same skill cluster who have made an equivalent investment in education and training.[4]

Micro-and Macro-underemployment

The average rate of return on an investment in human capital (where the investment cost includes direct costs and indirect costs of

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[2]Later in this chapter we illustrate that undervaluation of human capital can be used as a proxy for technical underutilization. Conceptually, technical underutilization of skills (i.e., the degree to which endowed skills exceed technical job requirements) could be viewed directly against a numeraire such as the types of jobs that people with similar skills perform at the current time. As we point out in the measurement chapter, however, this numeraire is more difficult to pinpoint.

[3]A numeraire may be thought of as an average which reflects a group norm. Since we are concerned with rates of return and earnings, the numeraire is expressed in these terms. Given the average or normal rate of return for a group (the numeraire), it is then possible to compare a subgroup's rate of return with the average or norm of a larger group. Since underemployment is relative (relative to how others with a similar investment in training are doing), the numeraire is required.

[4]Skill or occupational clusters are occupations linked through the homogeneity of skill attainment of workers in them or through the homogeneity of skill content of the jobs. The jobs or skills are qualitatively similar within the cluster, and the investment required to obtain them is about the same. A method of determining job or occupational clusters would be to observe mobility patterns of workers among jobs. Jobs which had high mobility rates among them under normal circumstances would be considered as being in the same cluster.

foregone earnings) for a group of individuals with the same skills will not necessarily provide the same numeraire as would a numeraire based on the average rate of return for a group which made an investment in the acquisition of different skills. Yet we require both numeraires if we wish to recognize two different forms of underemployment--what we call, for convenience, micro- and macro-underemployment--consistent with our definition.

Micro-underemployment

Micro-underemployment, which we emphasize in this report, is a form of underemployment that is peculiar to individuals or cohorts of individuals within an occupation or occupational cluster[5] rather than peculiar to the occupation or cluster itself. The underemployment in this case is intraoccupational in nature, and the comparison is among individuals with the same or similar training. Most importantly, the underemployment problem rests with some characteristic of the individual other than his skill. This point is contrary to most discussions of underutilization of human resources in which the quantity or quality of education has been pin-pointed as the key barrier. An illustrative question under this heading might be: Why do

[5]Since occupational clusters are identified through skills of incumbent workers, the terms "skill cluster" and "occupational cluster" are used interchangeably here. In addition, we assume that skill reflects the education and training in which an individual has invested.

lawyers with certain characteristics earn less than the average for all lawyers?

Micro-underemployment may occur because of numerous barriers to mobility: for example, employers' search costs related to the hiring of workers, or workers' costs of search for alternatives (or inadequate knowledge), cost of spacial movement even if the alternative is known, discrimination, and temporary or part-time attachment to the labor force. These barriers and others which we discuss in the following chapter represent possible causes of micro-underemployment. At this juncture it is important to note that some underemployment of this form may be optimal in the sense that the costs of overcoming it may outweigh the benefits associated with the reduction.[6]

Macro-underemployment

In contrast to the form of underemployment described above, macro-underemployment occurs when the typical individual in an occupation, or in a cluster of occupations where skills are similar, is underemployed relative to the average worker in other occupations requiring different training. What we call macro-underemployment is not peculiar to the individual but rather to his skill or to the cluster of occupations in which individuals with his skills normally work. The underemployment in this case is interoccupational[7] in nature, and

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[6]There also may be a divergence between what is socially and privately optimal.

[7]Interoccupational in this context also refers to occupational or skill clusters.

the relevant comparison is between rates of return for the average individual in an occupation relative to the rate of return for individuals who have made investments in different skills and who are in other occupations. The important distinction between macro-underemployment and micro-underemployment is that, in the former case, it is the nature of the individual's training (not the quality or quantity of it but the demand for his skill relative to supply) which causes his problem of underemployment. In contrast, micro-underemployment is caused by other socioeconomic barriers peculiar to the individual. The illustrative question this time might be: Why is the rate of return on human capital investment higher for chemists than for engineers?[8]

An individual's underemployment may represent both micro- and macro-underemployment at the same time or either form by itself. Because the causes of the two sources of underemployment are not the same, and therefore the solutions to the problem differ, it is important to distinguish between micro- and macro-underemployment.

Clarification and Additional Implications

The procedure for further discussion and clarification of the definition of underemployment will be to focus on key parts of that definition. This procedure forces us to be explicit about what our definition really means.

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[8]Note that the rate of return takes account of both costs and returns associated with an investment.

Involuntary Underemployment

In the definition provided above, we refer to underemployment as an "involuntary" employment condition. This view is consistent with the concept of unemployment where, by definition, unemployment is an involuntary condition.[9] It may be of interest to know why certain individuals "choose" either not to work or to work at jobs which do not effectively utilize their skills. Our concern here, however, is to identify labor market imperfections which "prevent" individuals from effectively utilizing their skills; this approach to the problem of underemployment is the most interesting from a public policy point of view.

The distinction between what is and what is not involuntary underemployment is not always clear, as the following example illustrates. A significant proportion of women, either by design or of necessity, will select part-time work when they are in the labor market. For some women, work is only a temporary activity; for other women, the part-time work may represent a permanent job. Given the limited range of jobs in the part-time sector of the labor market, the probability of underemployment will rise in the part-time sector with the skill level of the workers since there are few highly skilled part-time jobs available. The question arises: Are women who voluntarily work part-time and are underemployed in that condition because they chose part-time work; or are they involuntarily underemployed because

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[9] Individuals who voluntarily are not working are not considered to be in the labor force and therefore are not counted in the unemployment statistics.

they are not able to effectively utilize their skills, regardless of the fact that they chose part-time work?[10] Any decision on this issue is bound to be arbitrary to some extent. We choose to treat part-time work in a manner similar to its treatment in the unemployment statistics: an individual who is not working but who is available and actively seeking part-time work is considered to be just as unemployed as is the individual who is looking for full-time work. In our judgment, the concept of involuntary underemployment should not exclude part-time workers a priori. Admittedly, the magnitude of the problem may be very different for the part-time worker relative to the full-time worker; determining the magnitude of the problem, however, is an empirical issue, and it would be presumptuous to discount underutilization of skills in the part-time labor market, expecially since part-time workers make up a significant proportion of the labor force.

Our definition, as stated, does not require the underemployed person to be actively seeking[11] another job which would better utilize his/her skills. However, it might be assumed that if an individual were underemployed and not seeking a better job, the costs of finding the alternative outweigh the difference between the opportunity cost

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[10] Note that the underemployment results from the underutilization of skills, not the number of hours of work. We could adjust part-time hours to a full-time equivalent and underemployment would still be evident.

[11] In order to be classified as unemployed in current labor force statistics, one must be "actively" seeking and "available" for work.

of the current job (the wage in the best alternative job limited only by skill) and the wage paid on the current job. The cost, which may be substantial, represents a barrier such that an active search for alternatives is not worthwhile.

We do not make judgments here about whether underemployment is more severe (more or less voluntary) in the case of a primary wage earner than, for example, a spouse who may be marginally attached to the labor force. In either case we assume there is a desire to utilize skills because the rate of pay received is expected to be higher when skills are utilized than when they are not.

Part-time Work

Our definition of underemployment does not differentiate between part-time and full-time work as a criterion for inclusion or exclusion from the definition.[12] Instead the definition refers to utilization of skills per unit of time worked independent of length of time worked.

Viewed in this way, a worker who utilizes his/her skills but only works part-time is not underemployed since marginal productivity will be reflected in wage rate paid.[13] The key is rate of pay for given skills or technical usage of skills, not number of hours of

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[12]As mentioned earlier, underemployment is sometimes referred to as involuntary part-time work. U. S. Bureau of Labor Statistics, How the Government Measures Unemployment, Report 418 (Washington, D. C.: Government Printing Office, 1973), p. 8.

[13]Part-time workers may be paid less than their marginal product simply because they have few options if they want part-time work; or they may represent a relatively higher fixed cost compared to the full-time worker, in which case the part-time wage may be reduced to recoup the additional employment cost.

use. This view is consistent with the decision to view underemployment as inefficiency on the job, not the absence of all or part of a job. In short, underemployment refers to the quality of work, narrowly defined by the rate of return on human capital and technical utilization of skills, rather than to the quantity of work. Note that in calculating rates of return, part-time workers' wages would have to be adjusted to a full-time equivalent for purposes of comparison, otherwise their rate of return would be very low.

Underutilization of Labor in Employment

It is important to recall that the definition of underemployment suggested here refers to a condition within employment, not unemployment. In our judgment, the clearest conceptual boundary between underemployment and unemployment is that the former represents underutilization of labor in employment, while the latter represents underutilization of labor due to total or partial absence of work per se. Considering underemployment to be a condition of employment is consistent with the very nature of the word.

Viewing underemployment as underutilization in employment does not mean that underemployment and unemployment are not closely linked in a dynamic labor market. If underemployment increases in the labor market, workers of a given skill level will begin to enter at job levels previously held by individuals with lesser skills. This "bumping down" process will eventually lead to the least skilled workers being "bumped out" into unemployment, or the least skilled entrants will not find work. Changes in demand (number and quality of vacancies) and

supply (number and skill of workers) in the labor market will influence the distribution of underemployment and unemployment and their interaction.

Underemployment from the Individual's View

The definition of underemployment suggested here identifies underutilization from the individual's point of view. The reason for this clarification is that objective functions of individuals, employers, and governments may differ. What underutilization is to one may not be underutilization to the other.[14] Other factors the same, employers will be better off in terms of lower unit costs, higher productivity, and greater profits if work positions held by less skilled workers are upgraded by hiring more skilled employees. Profit maximizing firms will try to select the most skilled worker,[15] other factors the same. This strategy could lead to underutilized labor from the individual's point of view but could be a desirable outcome for the firm.[16] An

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[14]This point is raised but not resolved in Glen G. Cain, Richard B. Freeman, and W. Lee Hansen, Labor Market Analysis of Engineers and Technical Workers (Baltimore: John Hopkins Press, 1973), p. 32.

[15]Hiring at levels where skills are far in excess of job requirements leads to more rapid voluntary turnover, however. See Ivar Berg, Education and Jobs: The Great Training Robbery (Boston: Beacon Press, 1971).

[16]Economic theory suggests, however, that if one group (firms) can (do) fully compensate another group (workers) for being underemployed and can pay his compensation out of the increased profits due to greater efficiencies, then the situation is optimal. If the firm's increased efficiency and profits, due to using the higher skilled workers, cannot compensate the workers for enduring underemployment, the situation is not optimal. See James M. Henderson and Richard E. Quant, Microeconomic Theory (New York: McGraw-Hill, 1958), p. 219.

employer who is able to discriminate against a worker and pay him less than some norm for skills which the individual possesses does not view the situation as an inefficient one. Nevertheless, the worker who is subjected to the discrimination is clearly underemployed from his point of view.

Government's objectives do not necessarily coincide with either the individuals' or the employers' objectives. For example it may be desirable, from a public policy point of view, to have particular skills or occupations in surplus, such as in the defense area, so that in case of emergency the lags in production of defense goods and services are minimized. The armed forces are perhaps a good example of an excess supply of labor, a form of underutilization that governments are willing to tolerate. The overall welfare implications of underemployment are complex, and social and private costs and benefits of underemployment undoubtedly diverge in many cases. Despite the points made above, it probably is not too unreasonable to suggest that beneficial underemployment reduction based on the individual's calculus is usually consistent with governmental objectives as well as the objectives of firms. Efficient utilization of any resource usually means higher productivity, wages, output, expenditures, sales, and taxes.

Current Skills

In comparing skills of workers with job requirements, the ideal focus is on current skills, not potential or past skills. If potential skills are compared with technical job requirements, then every worker must be considered underemployed, since all workers have the potential,

with additional training or with improved complementary inputs, to raise their level of productivity.

To some readers it will appear as if we have excluded the major existing type of underutilization of human resources. Perhaps that is true. In no way do we belittle the problem; however, the potential to be more productive usually means one of two things: (1) an individual's productivity can rise with additional skill development; or (2) an individual's productivity can rise with improved physical capital equipment with which to work, assuming skill level is the same. It is clearly important that people receive an adequate level or amount of training. Our focus, however, is on the issue of how well they use what they presently have.

Just as everyone is potentially more productive with additional training, so can everyone be more productive with additional physical capital aids--direct telephone lines, computer terminals, teletype, the latest printouts of data for decision making. But we must take the current stock of capital, both physical and human, as given in order to judge the extent to which current resources are underutilized.[17]

Education completed at some period in the past but not complemented by work experience may result in erosion of human capital or skill[18] in the same way that physical capital can be expected to

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[17] In other words, we must take the production function as given when considering utilization of resources.

[18] Harry E. Suter, "Occupation, Employment, and Lifetime Work Experience of Women." Paper presented at meetings of American Sociological Association, August 22, 1973, New York.

depreciate if not used. On-the-job training provides additional increments to human capital for a worker as well as complementing formal education.

In comparing skills of a worker with technical job requirements, the vintage of his/her human capital stock should ideally be taken into account in the measurement of underemployment, for it is the current stock of skills which should be used in the comparison.

Given that work experience and on-the-job training are significant components of human capital,[19] then current skills measured by a certified degree or formal number of years of education will understate the true skill level of a worker who has received significant complementary skills from his job. The ideal measure of underemployment should take uncertified on-the-job training into account. If not, the estimate of underemployment would be biased downward. Employers themselves often forget that skills are not necessarily reflected in formal or certified skills, and workers may suffer underemployment due to "credentialism,"[20] a phenomenom we discuss in the following chapter.

Human Capital

In concept of human capital was explained in Chapter 2. Briefly, the notion assumes that individuals, privately or collectively, invest

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[19] Barbara R. Bergmann, "Comment," in Discrimination in Labor Markets, edited by Orley Ashenfelter and Albert Rees (Princeton: Princeton University Press, 1973), p. 153.

[20] "Credentialism" occurs when hiring or promotions are based on diplomas, degrees, etc. instead of on actual demonstrated skill.

in themselves and that the resulting productive skill characteristics, when utilized, provide private and collective returns on the investment (foregone current consumption).[21] Theoretically, investments will be made in skill areas which have the highest marginal return, which will cause returns in these areas to fall as investment increases. The process will continue in the absence of barriers until the point at which net marginal returns to investments in various skills are equalized.[22] That is, in equilibrium the rate of return to human capital investment is the same in any education endeavor. The equilibrium rate for human capital investment will equal the rate of return on all alternative investments. In equilibrium the "going" rate of return will equal the "going" rate of interest (cost of borrowing).

Of course, locating equilibrium points is an elusive process; they are never reached in the dynamic world where information about relative prices (the best investments, taking account of costs) is imperfect. Also, information has a cost which would prevent equality of rates of return.[23] Continuous changes in demand for and supply of

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[21] Even if education's main function were to certify individuals with ability rather than provide skill, the investment approach still makes sense if a degree or level of education is required to obtain jobs with higher pay.

[22] "Net" means taking account of costs as well as revenues.

[23] This would be true unless it happened that all investments carried the same information costs.

labor would shift the path toward a mobile equilibrium.[24] In the next section, we discuss the need for at least a proxy for the equilibrium rate of return on human capital.

Underemployed, Undervalued, and a Numeraire

In our definition, if an individual is underemployed, his/her human capital is undervalued. This view raises the question: underemployed or undervalued relative to whom? To answer this question we need to bring in the notion of a numeraire. The numeraire serves as a base from which to compare an individual's or a cohort's rate of return on an investment in a particular skill.

If information were virtually free and widespread regarding pay-offs for various educational investments and if the equilibrium rate of return were known, the equilibrium rate of return could serve as a numeraire. Individuals or occupations (skills) receiving less than this rate of return would be defined as underemployed. As noted above, however, the equilibrium rate is elusive, but a rule-of-thumb estimate of 10 percent is often used as a proxy for the "going rate" or equilibrium rate of return.[25] Thus, this rate could serve as a

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[24]That is, we could never arrive at "the" equilibrium rate of return or the "going rate" of return because of continuous change in demand for and supply of different skills and other uses of investment funds.

[25]Richard S. Eckaus, Estimating the Returns to Education: A Disaggregated Approach (Berkeley: Carnegie Commission on Higher Education, 1973), p. 7.

numeraire from which to compare rates of return to investments in human capital. This approach seems particularly useful in measuring what we have called macro-underemployment, where comparisons among occupations or skills are relevant. In the case of micro-underemployment, where the focus is within a skill group (job cluster), the numeraire should reflect a narrower reference group, such as the current average rate of return to a skill in that occupation or occupational cluster.

The above discussion foreshadows some of the problems encountered in measuring underemployment, problems which are discussed in Chapter 5. At this point, however, it is important to note that, in our judgment, differences in rates of return on human capital investment among skills or occupations, or within them, provide the firmest foundation for viewing underemployment.[26]

The Relationship between Undervaluation and Underutilization

The assumption that, other things equal, individuals' rates of return to investments in skills will be greater as their skills are more fully utilized on the job provides the important link between undervaluation and technical underutilization in our definition.

In the above context, skills are defined as attributes that people receive in the education and training process. As noted earlier,

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[26]The alternative, which might be preferable but at present seems more remote given data limitations, would be comparing technical skills of workers directly with technical requirements of the job they perform.

individuals' skills are not simply a function of education and training; rather, skills reflect abilities which are innate or may be nurtured outside of the education or work environment. Those individuals with an advantage in "external" skills will receive an "economic rent"[27] in addition to returns they receive for investing in particular skills through education and training. Conceptually, we can separate earnings related to "external" skills from earnings related to skill attributes gained through education and training.[28]

Assuming that education and training provide specific skills[29] and that jobs contain specific tasks, it is expected that employers will pay a premium to workers whose skills most closely match job requirements.[30] Employers behave this way because, other things the same, the marginal product[31] of a worker will be greater the more exact the "match" between his/her skills and job requirements. That is, the greater the worker's contribution to output revenue, the more the employer

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[27]Economic rent in this context is that part of an individual's income which is explained by his special talents, talents which are not generally possessed by individuals with similar education and training-related skills.

[28]Empirically, the problem is to control for I.Q., family background, etc. when the goal is to identify the relationship between earnings or rates of return and education.

[29]Education is both specific and general, depending on curriculum pursued. General skills will fit into broader occupational groups. Although it becomes less clear into which occupation the person with a general education might fit, the conceptual discussion is not affected.

[30]The premium may be in the form of obtaining the work position. That is, if two workers apply for a job vacancy, the worker with the most closely related skills will get the job, other factors the same.

[31]Marginal product is defined as the incremental contribution to total output by the addition of one worker.

can afford to pay a worker. Of course, a worker's marginal contribution to output will depend not only on his education and training skill attributes but also on his "external" skills. In addition, marginal product of labor depends on the characteristics of other inputs in the production process, for example, the quantity and quality of physical capital he works with. However, these "other" factors which affect marginal productivity and wages do not vitiate the relationship between the utilization of skills (received in the education and training process) and earnings or rates of return on the educational investment; they simply make the empirical problem more "messy."[32]

It is not necessary that the posited relationship between utilization and valuation hold in every case; it need only be true in the typical or average case. All of us know of an individual who does not work in a job related to his training, yet earns as much or more income than those people with whom he went to school. Examples like this do no damage to our central argument; they are exceptions, not the rule. In addition, many of the exceptions can be attributed to "external" skills which enable the individual to earn a substantial income in a job which is not closely related to his training. Also, apparent mismatches between job content and formal education will be reduced when account is taken of on-the-job training. On-the-job training or work experience may substantially alter the skill attributes of an individual. Again, this becomes a "messy" empirical

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[32]As we describe in the measurement chapter, multiple regression analysis is useful for controlling for "other" factors when the focus is on the relationship between education-related skills and earnings or rates of return on human capital investment.

problem, but it does not change the underlying relationship we have specified.

If employers do not consider marginal product when they set wages or when they hire workers and if marginal product has no significant relationship to education and training received, then there is no reason to expect the relationship between undervaluation of human capital and technical underutilization of skills to hold. If we discard the education-productivity-earnings relationship as being insignificant, then we must conclude, as Thurow does, that:

> The concept of human capital loses its economic meaning. It no longer reflects productive capacities, and it no longer can be viewed in the same light as physical capital. In a fundamental sense the problems of determining individual incomes cease to be economic and become sociological or institutional.[33]

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[33] Lester C. Thurow, Investment in Human Capital (Belmont: Wadsworth, 1970), p. 18. Thurow points out additional implications of rejecting marginal productivity theory:

> If individuals are not paid their marginal product, the capitalizing of earnings does not help solve four fundamental problems that human capital concepts were introduced to solve. (1) Capitalized earnings cannot be used to quantify and measure the inputs of productive resources. (2) Individuals will still be interested in finding the factors that increase their own earnings, but the search will not focus exclusively or perhaps even primarily on productive skills, knowledge, and talents. Investments in productive skills would not increase earnings or human capital. (3) If changes in capitalized earnings do not reflect changes in productivity, human capital cannot be used to help explain the sources of economic growth. Changes in earnings have little or nothing to do with changes in output. (4) Altering the income distribution would still be an important problem, but attempts would have to shift from efforts to change productive capacities (education, manpower training, etc.) to whatever other factors do in fact alter earnings (p. 18).

It is important to emphasize that calculations of rates of return, designed to reflect the utilization of skills obtained through education and training, would have to be adjusted for numerous other factors which influence earnings. This is an empirical issue addressed in Chapter 5. The above discussion has provided a conceptual rationale for the assumption that, other factors the same, individuals' rates of return to investments in skills will be greater as their skills are more fully utilized.[34]

Major Exclusions under This Definition

The definition given at the outset of this chapter does not include a number of conditions which other investigators have termed "underemployment." Our definition excludes inadequate quantities of work and conditions of total unemployment. Therefore, part-time work taken when full-time work is desired is neither a necessary nor a sufficient condition for underemployment. Discouraged workers, out of the labor force but available for work, are not considered underemployed. Workers who have the potential, through training, to be

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[34] There is some empirical support for the conceptual view expressed above. A recent survey of nearly one half million individuals who graduated from college in 1972, and who were working full time, showed that the more directly that individuals' jobs related to their education, the closer actual earnings were to the individuals' expected earnings. Over 50 percent of those individuals who stated that their jobs were directly related to their education, stated that their pay was about the same as they had expected. Only 28 percent of those individuals who stated that their training was not directly related to their job stated that actual earnings were consistent with their expectations. For the first group, only 11 percent earned substantially lower pay than they had expected; however, for the second group, 35 percent earned substantially lower pay than expected. See U. S. Bureau of Labor Statistics, Labor Market Experience of Recent College Graduates, Special Labor Force Report, Number 169 (Washington, D. C.: Government Printing Office, 1974).

upgraded in employment are not underemployed according to our definition. Workers who have the potential to perform at higher levels without additional training are considered to be underemployed. Voluntary underemployment is excluded in our definition. Income inadequacy *per se* is not a sufficient condition for underemployment.

Summary View of Underemployment

Underemployment, as we have defined it, can occur at both a disaggregate or intraoccupational level and at a more aggregate or interoccupational level. In this spirit underemployment occurs because an individual's skills: (1) *Exceed* the current technical skill requirements of the job that he/she performs. The degree of mismatch between the worker's skills and job requirements must be viewed against some numeraire, i.e., the type of job that people with similar skills or occupational training typically perform, which is a function of current demand for and supply of that occupation or skill. Individuals experiencing underemployment of this form are not effectively utilizing their skills, and this will be reflected in a relatively lower rate of return on their investment in that skill. This variant of underemployment can be called micro-underemployment. It is peculiar to the individual or to a socioeconomic cohort rather than to a whole occupation or skill cluster. This situation may or may not represent a disequilibrium within an occupation or set of skills. (2) *Match* the current technical requirements of the job that he/she performs, but the rate of pay is less than for the reference group. In this case the individual is not underutilized but undervalued. This type of underemployment is typical of outright discrimination. (3) *Exceed*

the current technical skill requirements of the job that he/she performs where this mismatch is typical for the occupational reference group as well. This form of underemployment can be given the appellation macro-underemployment. It is not peculiar to the individual; it pervades the whole occupation or cluster of occupations. In this case the underemployed are underutilized and undervalued. Underemployment of this type may be characterized by no disequilibrium within the occupation or set of skills but a disequilibrium among occupations. The rate of return in the occupation with underemployment is less than the average rate of return in other occupations requiring a similar investment in education.

The source of the underemployment is some form of labor market barrier. The barrier may exist on the demand side in the form of inadequacies in the employment and promotion process or on the supply side in the form of factors such as cost of search and geographic immobility. These barriers are the focus of the following chapter on the causes of underemployment.

CHAPTER 4

CAUSES OF UNDEREMPLOYMENT

Introduction

The goal of this chapter is to identify and discuss some probable causes of underemployment as defined in the previous chapter. In Chapter 2 it was pointed out that, under conditions of perfect competition, underemployment would be a temporary and unimportant phenomenon. In this frictionless environment, skills would be perfectly matched with job requirements, and the rates of return on investments in training would reflect workers' productivity; these rates of return would tend toward equality. In the real world, the factors that may produce underemployment are diverse. Nevertheless, economic theory and some admittedly crude empirical observations suggest that these may be subsumed under several broad headings: inadequate labor market information or employers' and employees' costs of search,[1] prejudical discrimination, and the costs of mobility. As will be seen below, the dividing

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[1]For an "economics" approach to information and search costs in the Labor market, see G. Stigler, "Information in the Labor Market," Journal of Political Economy, Supplement (October 1962): 94-105: A. Rees, "Information Networks in Labor Markets," American Economic Review (May 1966): 559-566: L. Sjaastad, "Costs and Returns of Human Migration," Journal of Political Economy, Supplement (October 1962): 50-79: John McCall, "Economics of Information and Job Search," Quarterly Journal of Economics (February 1970): 113-126: C. Holt, "Job Search, Phillips' Wage Relation, and Union Influence: Theory and Evidence," in Microeconomic Foundations of Employment and Inflation Theory, edited by E. Phelps, et al., (New York: W. W. Norton, 1970).

lines between these broadly defined sources of underemployment are not always clear.

We begin this chapter by identifying four dimensions of the labor market where information is vital to the full utilization of human resources. To the extent that these types of information are inadequate, underemployment will result. Following this discussion, we focus on the probable causes of micro-underemployment. Under this heading, we develop a simple model of the hiring and promotion process and illustrate how inadequate information can result in micro-underemployment. Attention is then given to labor market discrimination, a source of micro-underemployment which is clearly related to the information issue yet contains other distinct elements. Following the discussion of labor market discrimination, we suggest some additional causes of micro-underemployment. The final section of this chapter addresses the problem of macro-underemployment and its probable causes.

Labor Market Information

Figure 3 identifies four basic segments of the labor market where extensive information is required: (1) the demand side (jobs), (2) the supply side (workers), (3) the nexus between demand and supply that links workers with jobs and produces wage outcomes, and (4) the government as the clearinghouse for labor market information.

Demand for Labor

Given wage costs, a difficult task for employers is selecting the most productive workers for job vacancies. Even if search costs

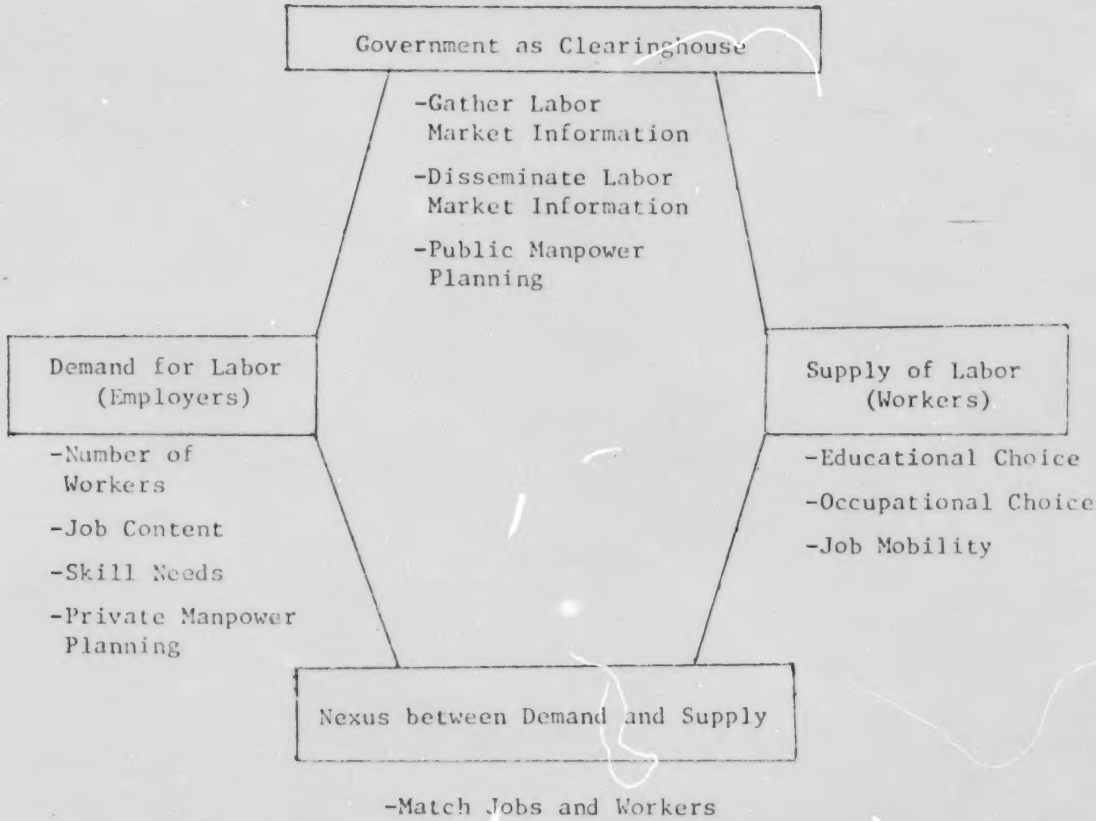

FIGURE 3. Four Major Information Points in the Labor Market

were a small constraint, the task would not be simple. The two basic informational needs for those on the hiring side are information on the current and potential productive capacity of applicants for the vacancy. Unfortunately, information in the area of internal manpower planning is generally not available to firms, nor is it easy to obtain.

Firms usually do not have detailed information on job content or on how jobs are related through task analysis. Ideally, internal job clusters as well as optimal mobility routes through the firm need to be identified before a lower position is filled. The type of employee a firm needs depends on the nature of the current job, the expected evolution of the job as well as the individual in it, and its relationship to other activities in the firm. In short, detailed internal manpower planning, including forecasting future requirements, is a most desirable part of the selection and promotion process. The absence of this adequate information will result in a mismatch between demand for and supply of labor, the result being underemployment.

Assuming that the firm has a clear view of job content, it must be able to identify productivity characteristics of job applicants that will match job vacancies. Considerable costs must be incurred to gather this information. Again, even if costs were not a limiting factor (which they are), precise measurement techniques do not exist for identifying the "best" applicant. For these reasons, proxies are used to provide the desired information while keeping costs at a reasonable level. To the extent that surrogate measures are inadequate,

and it appears that many of them are,[2] the result is a mismatch between demand and supply with resulting underemployment.

In summary, underemployment is likely to result to the extent that firms have inadequate information on job content of their vacancies, to the extent that they cannot correctly identify worker productivity characteristics, and to the extent that they minimize the risk of hiring an unqualified worker.[3]

Supply of Labor

Another important component of the labor market where information is required is the supply side. Although education in its broadest sense means much more than an investment for future return, the investment aspect is nevertheless central. Given our previous discussion of human capital, it is expected that rational individuals will benefit in their choice of educational program and occupation by improved awareness of skills for which there is a strong demand.[4] In the same way that employers benefit from identifying skill attributes of job applicants, applicants benefit from knowledge of job attributes including remuneration. In fact, the amount of knowledge available

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[2]See Gerald Glyde, "Socioeconomic Characteristics of Voluntary Labor Mobility," unpublished doctoral dissertation (University of Illinois, 1973), and Evar Berg, Education and Jobs: The Great Training Robbery (Boston: Beacon Press, 1971).

[3]If aggregate demand is at a very high level, firms can be expected to lower their hiring standards, and thus underemployment would be less likely to occur than under normal conditions.

[4]The provision of "better" labor market information does not guarantee that it will be utilized effectively. There is some evidence that high school students need to go through a trial work period in order to make effect occupational choices. See J. O. Crites, "The Development of Occupational Choice," in Vocational Psychology (New York: McGraw-Hill Book Company, 1969), pp. 155-213.

to make educational and occupational choices is rather limited. Among other imperfections in information, labor market conditions may change between the time at which educational choices are made and the time at which individuals reach the labor market.

Nexus between Labor Demand and Supply

At this point we wish only to emphasize the information problem where demand for and supply of labor meet. After mentioning the fourth information area in Figure 3, we explore the hiring and promotion process with the use of a simple model which assists in understanding the significant ways in which firms adjust to inadequate and costly information.

Both firms and individuals have to make labor market choices in this imperfect world. In addition to limited information, firms must select workers from a limited supply and workers must select jobs from a limited demand for labor. The nexus between demand and supply is the forum where the choices are made and prices (wage offers and reservation wages) are set. As a result of the imprecision, firms take action to minimize risk and uncertainty. These actions, while perhaps being optimal for the firm and protecting it, may result in underemployment of individuals. Internal information is required by firms and external information by workers, but even more is required when the two meet in the hiring and promotion process. We explore this aspect after identifying the fourth area where labor market information is critical.

The Government as a Clearinghouse for Labor Market Information

In Chapter 3 macro-underemployment was referred to as underutilization which was typical of a whole skill or skill cluster. Underemployment of this type is often the result of inadequate information--information that could be provided by government manpower specialists. Just as private firms need to practice private manpower planning, so do governments need to engage in public manpower planning. This involves gathering information on the supply side of the labor market, such as determining educational attainment levels of the labor force and trends in educational and occupational aspirations. On the demand side, information needs to be gathered on industrial and occupational employment trends, on input-output relationships, and on changes in technical coefficients.[5] The last of these portends changes in the demand for labor.

In addition to gathering information from the private sector, the government's role is to provide feedback to the private sector on both the demand and the supply side. In the private sector, both firms and individuals can be expected to generate self-centered information, but they will not invest in the general availability of labor market information. The provision of better information for all is a collective responsibility, a responsibility which lies in the public sector. With the general improvement in information, underemployment can be expected to be reduced. Conversely, if we do not

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[5]Technical coefficients refer to the form and mix of inputs and technical processes that produce outputs--changes which will change the demand for labor.

improve the availability of labor market information to employers, job applicants, and those who are already working, underemployment will be worse than otherwise.

In summary, extensive information is required both by employers on the demand side and by workers on the supply side of the labor market, at the nexus of demand and supply where hiring and promotion take place, and by governments. Inadequacies in these information areas can be counted as significant causes of underemployment.

Causes of Micro-underemployment

In this section, we discuss a number of probable causes of micro-underemployment. First, with the aid of a simple model of the hiring and promotion process, we illustrate how an individual's human capital may be discounted and, therefore, how the rate of return on his training investment may be less than that of an appropriately defined reference group. The emphasis in this model is on inadequate labor market information in the hiring process. Second, we focus on labor market discrimination. Admittedly, labor market discrimination results, in part, from inadequate information in the hiring process; yet discrimination is also the result of prejudice and other factors not related to the cost of information. Given this distinction and the nature of our discussion of discrimination, we have chosen to separate the discrimination issue from the hiring and promotion model which emphasizes the information problem. Clearly, there is a close relationship between the two issues, and the division is admittedly somewhat arbitrary. Third, we discuss some other probable causes of underemployment: costs of mobility, part-time work, and weak labor

force attachment. These issues are also related to information in the labor market but have unique characteristics as well.

A Hiring and Promotion Model with Imperfect Information

Even though labor market information is imperfect and predicting the potential of job applicants is tenuous, numerous methods are used to attempt to make more informed decisions on matters such as the probable job attachment of applicants for job vacancies. The fact that employers ask a considerable number of questions on job application blanks, which provide them with socioeconomic data, suggests that they are interested in these variables for some purpose--perhaps as proxies to indicate the potential of the applicant. In considering job applicants, an important factor is their expected job performance, an important element of which is the probability of quitting. In the vast majority of hiring situations, employers desire workers to have strong job attachment, as we illustrate below.[6]

If labor costs were totally variable, employers would not be concerned about rapid voluntary turnover. In the vast majority of work environments, however, workers represent both fixed and variable costs, the former often being substantial.[7] The cost of voluntary

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[6]Some employers in the secondary labor market may not worry too much about rapid turnover, but this is clearly not the case for most employers who have substantial fixed costs invested in each worker.

[7]In the process of selecting a new employee, several applicants have to be processed. Advertising the vacancy, processing applicants, testing, and selecting represent significant costs.

turnover to employers is in part a function of hiring (search) and training costs. In addition, the neophyte worker may require additional time after training to adjust to a new work setting, the implication being that marginal wage costs may initially exceed marginal output. To the extent that fixed costs are important in the employment process, employers must be concerned with the worker's propensity to quit since these costs are only recouped if the employee remains on the job for a certain period of time.

Suppose a male (M) and female (F) with the same amount of human capital (HC) applied for the same job vacancy at a particular level in the job hierarchy. From the employer's point of view, it makes sense to estimate the probability that M and F will quit within some period of time. The decision to hire, then, may be based on the discounted valuation (DV) of an applicant's HC. The probability that someone will quit is not part of their human capital, so DV is estimated by weighting (W) the applicant's human capital. Assume that W is the probability that an individual will not quit within some specified period. The employer estimates W_m and W_f and applies these weights to HC_m and HC_f. Given the "conventional wisdom" regarding women and job attachment, W_f will be smaller than W_m, and the hiring decision may be based on Equation 1 below.

$$(1) \quad HC_m \cdot W_m = DV_m > HC_f \cdot W_f = DV_f \qquad (HC_m = HC_f)$$

In this model F will have the same chance of obtaining a job as M when DV_f is equal to DV_m. F will have to drop down the vacancy hierarchy until employers view her DV as being greater than M's for a vacancy at a given level. The point is that women will be underemployed

as long as employers generalize the view that women quit more readily than men. The return on their human capital will be less than that of men, as will the utilization of women's skills.

Whether this situation is deemed discriminatory depends on how one defines discrimination. It also depends on the quality of information that employers have at their disposal to make judgments regarding W.[8] All of these issues have strong implications for underemployment. In the above model we have been referring to hiring. The same model can be applied to the promotion process where characteristics of workers are used to discount human capital.

Given the above model, what can we say about the causes of underemployment? If employers are correct in their weighting, then the cause could be weak job attachment of women in general. But even if women have weaker job attachment on average than men, a significant proportion of women may have stronger job attachment than the men with whom they are competing for particular job vacancies.[9] In this

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[8]The information employers use may not be very good. Studies often show that, by gross measurement, women's turnover rates exceed those of men. However, women tend to be concentrated in high-turnover occupations, and men in those occupations also have high turnover rates. When occupational distribution is accounted for, the relationship between turnover and sex classification is not so clear.

[9]This phenomenon is often referred to as statistical discrimination. See Robert E. Hall, "Prospects for Shifting the Phillips Curve through Manpower Policy," Brookings' Papers on Economic Activity 3 (1971): 683.

case, inadequate labor market information or bias on the part of the employer is a cause of underemployment.[10] If employers, on the average, are correct, they may not wish to invest in further information to change their perception of the situation. In fact, given the cost of information, the situation could be optimal for employers, but it clearly results in underemployment for women in this case.

Above, the weighting of human capital referred to the propensity to quit, and reference in this case was to women. In fact, as illustrated below, we could think of a number of weights (W_i) with which to discount (or inflate) human capital. Whether in reference to men or women or to factors other than the probability of quitting, any variable which is used to weight human capital may represent a cause of underemployment. Discounting an individual's human capital will cause him/her to end up at a lower level in the job hierarchy, which less efficiently utilizes the individual's skills, and will provide him/her with less remuneration than otherwise.

Below we mention factors which could be used as weights. A weight may be based on fact or fancy; it is the perception of the employer that is important not how accurate the weight is. The employer is likely to make errors in some cases and make correct judgments in others. The point is, however, there is considerable

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[10] "The employer faced with choosing to reduce one error at the expense of the other will most often reject workers who are actually qualified but whose qualifications are expensive to uncover." See Peter B. Doeringer and Michael J. Piore, Internal Labor Markets and Manpower Analysis (Lexington, Mass.: D. C. Heath and Company, 1971), p. 139.

room for error. The problem, again, is one of inadequate information, information which is costly to obtain. Without going into great detail here, we can mention other variables which could be used as weights (W_i) just as easily as the propensity to quit was used in the above example.

The human capital of a nonwhite job applicant, even though the same as that of a white competitor for a vacancy, may be discounted[11] or in some cases may actually be inflated.[12] The general factor used as W_i in this case is socioeconomic background, including race. Applicants from well-off families have the advantage in most cases.

If a job applicant's work history shows a number of job changes or numerous and long durations of unemployment, his/her human capital will often be devalued. People with less desirable employment records,

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[11] According to Taylor, employers in many cases "insist that Negro workers are of a lower quality than whites in their current work force." See David P. Taylor, "Discrimination and Occupational Wage Differences in the Market for Unskilled Labor," Industrial and Labor Relations Review 21 (April 1968): 379. There is little clear evidence on this question which can be used for micro-level decisions on hiring; as a result, notions play too large a role in the selection process. The color of a worker may well be related to his job attachment to the extent that color is correlated with other factors which are related to job attachment. However, there is no reason to expect that color per se is related to job attachment.

[12] At upper levels where firms clearly lack minority representation, less qualified minority persons may get jobs in preference to majority groups persons.

as perceived by the employer, will have their human capital devalued even if they are, in fact, endowed with equivalent amounts of human capital compared to competitors for the vacancy. Obviously, there is considerable room for bias in this process as well as for legitimate screening; however, those individuals whose employment records are considered less stable will, on the average, end up being underemployed.

Age is another variable which may carry a significant weight. A qualification is necessary before considering this factor. Rates of return on human capital are calculated from age-earnings profiles; therefore, even though employers may discriminate against older (younger) workers, this discrimination will show up in everyone's rate of return to human capital because everyone ages. Since the labor market experiences of individuals vary widely, however, it is appropriate to discuss particular aspects of age which may result in underemployment for particular individuals or cohorts. Suppose, for example, a woman drops out of the labor force in her early twenties, and in her mid-thirties returns to the labor market, where she competes against younger individuals for job vacancies. The employer may well discount the older woman's human capital in the belief that her capital has eroded in the same way that physical capital does without use. This is an empirical question, and undoubtedly the degree of erosion varies greatly depending on the socioeconomic characteristics of the woman.

Therefore, if employers apply a general rule, underemployment is likely to result for the older woman.[13]

Handicapped workers undoubtedly suffer from discounting of their human capital. In some cases it may be that an individual loses some of his human capital as a result of his disability, but in many instances the employer may overreact to the disability and, being a risk averter, will discount the handicapped person's human capital such that underemployment results. Identifying the extent to which handicapped individuals maintain their productivity characteristics despite their disability is an empirical question. To the extent that employers overreact to the handicapped person's disability, underemployment is the outcome.

Another factor resulting in underemployment is credentialism. In this instance the employer puts a premium on a degree, diploma, or other certified skill. In terms of the model above, the employer discounts informal, or uncertified, human capital. Therefore, if two workers with equal amounts of human capital apply for the same job vacancy, the individual with the most formal training may often be selected. Again, the loser will go down the job hierarchy until his DV is at least as large as his competitor's. Credentialism is probably most severe at job entry as compared to the promotions process.

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[13] Employers, fearing turnover, are often reluctant to offer even low-paying entry-level jobs to older workers. Since entry-level jobs provide a pool for promotion to upper-level positions, many firms prefer "young blood." Older workers appear to benefit when their age has helped them attain seniority and gives them higher pay, better positions, and security. They appear to lose out, however, when applying for new jobs. See W. Willard Wirtz, The Older American Worker: Age Discrimination in Employment, Report of the Secretary of Labor to Congress (Washington: Government Printing Office, June 1965), pp. 12-14.

If both workers competing for a vacancy come from within the firm's ranks, there is much less uncertainty about informal skills and, therefore, less need to discount for risk or inadequate information. Of course, there is no guarantee that certified skills are actually as they appear on paper, but employers appear to rely heavily on screening through formal certification. On the basis of his survey of business executives, Berg states:

> To a man, the respondents assured us that diplomas and degrees were a good thing, that they were used as screening devices by which undesirable employment applicants could be identified, and that the credentials sought were indicators of personal commitment to "good middle class values," industriousness, and seriousness of purpose as well as salutary personal habits and life styles.[14]

Internal labor markets refer to labor markets within the firm, where most job vacancies can be filled only by employees of the firm through promotion. Competition for internal labor market vacancies by the external labor market is restricted to so-called "ports of entry." These positions consist of jobs at the lower end of the job hierarchy (there may be several hierarchies in a firm and, therefore, several ports of entry--e.g., production personnel may make up one hierarchy and middle management another).[15] Although internal labor markets are common, their structure is diverse.

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[14] Berg, op. cit., p. 78.

[15] For one of the best discussions of internal labor markets, see Peter B. Doeringer and Michael J. Piore, Internal Labor Markets and Manpower Analysis (Lexington, Mass.: D. C. Heath and Company, 1971).

Given internal labor markets, with seniority the rule rather than the exception, an outsider with the same amount of human capital as an insider will have his human capital discounted. Ignoring the external labor market may not be an irrational move on the employer's part since he has more information about the worker who has been employed within his firm than about other workers. Other things the same, however, the behavior of the internal labor market employer means that the external competitor will be underemployed.

If all workers, at one time or another, are faced with internal labor market barriers, then underemployment of this sort can be considered transitional. That is, although workers who are qualified for higher level jobs must start out at lower "ports of entry" levels, the relative effect of internal labor markets may be small. One of the requirements of moving up in the internal labor market, however, is strong attachment to the firm and to the labor force. Therefore, those individuals who drop out of the labor force more often than the average will face a greater probability of underemployment than otherwise. Also, members of those groups of workers who are expected (perceived by the employer) to have high quit rates are less likely to be promoted and hence face the possibility of transitional underemployment turning into permanent underemployment.

As opposed to hiring, which is the acquisition of an outsider for a position, promotion consists of sifting the current stock of workers and giving one a "higher" position. The promotion process causes underemployment when it is unable to place all workers in positions that fully utilize their abilities, either permanently or transitionally. In fact, a well-organized promotion process may

foster underemployment by having workers "prove themselves" in entry-level jobs and by causing companies to hire many workers to fill the "promotion pool." While all of these people in the promotion pool are underemployed, the company is assessing them in order to pick one for promotion to a position that will utilize his talents. This procedure may be rational for the firm, but it does lead to underemployment among the workers.[16]

All of the above potential causes of underemployment are related to labor market information or the cost of search. Identifying what constitutes discrimination (after a definition of discrimination is decided upon) and separating this from the employer who discriminates without prejudice is not a simple task. In the section which follows, we explore the issue of discrimination further. Much of the literature in this area is relevant to the problem of measuring underemployment, and discrimination, aside from inadequate information, is clearly a source of underemployment.

Prejudicial Discrimination

In 1973, adult white males accounted for half of the civilian labor force; white and nonwhite women and nonwhite men over 20 years

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[16] The promotion process seems to cause more underemployment for women than for men. Individuals in the group "female" may now be bearing the brunt of underemployment, but a less discriminatory promotion process may merely shift the underemployment to others minimally qualified for promotion but in the group "male."

old accounted for 30, 6, and 5 percent of employment, respectively.[17] There is substantial evidence that the human capital embodied in minority group workers is underemployed relative to that of the majority group, or white males over 20.[18] The true extent and causes of the relative underemployment of minorities are difficult to assess. However, this is one of the most visible forms of the problem and probably the most volatile from a social viewpoint. Further, to the extent that economic considerations govern individuals' investments in education and training, these differentials will perpetuate the underdevelopment of minority human resources; that is, members of minority groups will invest less in themselves because returns on their investments are smaller. This condition reduces the effectiveness of education as a policy variable in achieving a more equitable distribution of income.[19]

The relative underemployment of minorities is a subject that has received considerable attention from economists in the form of

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[17] U. S. Department of Labor, Bureau of Labor Statistics, Monthly Labor Review (July 1974).

[18] For example, the average years of education of white females is equal to that of males, but the ratio of female to male earnings is approximately .6; in 1972, the ratio of the median years of education of nonwhite to white workers was .9, but the earning ratio was .65; and nonwhite women had .95 the median years of education of white women and .85 of their earnings.

See U. S. Department of Commerce Bureau of the Census, Statistical Abstract of the United States, 1972, no. 188; V. Fuchs, "Differences in Hourly Earnings between Men and Women," Monthly Labor Review 94 (May 1971): 9-15; and R. Freeman, "Changes in the Labor Market for Black Americans, 1948-72," Brookings Papers on Economic Activity, 1973, 1, edited by A. Okun and G. Perry (Washington, D. C.: The Brookings Institution, 1973), Figure 1, p. 73.

[19] Lester C. Thurow, Poverty and Discrimination (Washington, D. C.: The Brookings Institution, 1969), p. 111.

theoretical and empirical analyses of labor market discrimination.[20] In spite of these efforts, however, the sources and effects of discrimination in employment are largely unresolved. Reference has been made to the difficulty of distinguishing between the "informational" use of, say, sex or race as indicators of probable work performance and their "prejudicial" use. The criteria that employers appear to use in their hiring and promotion decisions may be "discriminatory" in several senses: (1) They may be unrelated to work performance, in which case their application is necessarily discriminatory. (2) While they may be statistically related to productivity,[21] the relationship is apt to be an imperfect one. The criterion, therefore, is discriminatory for some individuals who possess or lack the characteristic in question. (3) The hiring and promotion standards may reflect prejudice rather than an effort to estimate individual workers' productivity. However, if these proxies are even loosely related to work performance or if biased statistical evidence is used to justify their use, it may be difficult to distinguish between prejudicial and informational hiring standards. Assume, for example, that an employer's

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[20] See, for example, A. Brimmer and H. Harper, "Economists' Perception of Minority Economic Problems: A View of Emerging Literature," Journal of Economic Literature 8 (September 1970): 783-806; and J. Madden, "Bibliography," The Economics of Sex Discrimination (Lexington, Mass.: D. C. Heath and Company, 1973), pp. 131-136.

[21] Use of the term "productivity" raises some special problems in the context of discrimination. In its traditional economic sense, it means the value of a worker's output per man-hour of labor. But what determines the value of output? For example, should the physical attractiveness of an airline stewardess be considered an integral element of her job performance? In general, if "output" is defined broadly enough, many forms of "discrimination" may be legitimized.

experience indicates that the job attachment of women in less than that of men. Can he, then, legitimately discount all women's capacity for work? Or, should this be interpreted as a form of prejudicial discrimination?[22] The determination of who is underemployed poses some conceptual problems, the answers to which are as much value judgment as fact.

Investigations of labor market discrimination also encounter some empirical problems that have a bearing on the broader issue of identifying and measuring underemployment. We would describe employment as discriminatory in a prejudical sense when a "minority" group, due to its possession of a noneconomic characteristic, receives a lower rate of return on its human capital than does a "majority" group with

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[22]"One of the basic problems in research into discrimination in employment is that different researchers employ different concepts of discrimination. Their definitions are rarely explicit, but become discernible only through careful examination of their writings and analysis." D. Hiestand, Discrimination in Employment, An Appraisal of the Research (Ann Arbor, Michigan: Institute of Labor and Industrial Relations, The University of Michigan-Wayne State University, 1970), p. 5

At least two contributors to the discrimination literature imply that the distinction between "statistical" and "prejudicial" discrimination is a spurious one:

"Discrimination is the process of forming stereotyped views that all members of a particular group are assumed to possess characteristics of the group." F. Weisskoff, "Women's Place in the Labor Market," American Economic Review 62 (Supplement, May 1972): 164.

"Discrimination is no less damaging to its victims for being statistical. And it is no less important for social policy to counter." E. Phelps, "The Statistical Theory of Racism and Sexism," American Economic Review 62 (September 1972): 661.

the same productivity characteristics.[23] Although this definition avoids any judgment as to the causes of discrimination, it is consistent with those that do so. It does not, however, infer discrimination from unequal patterns of employment per se. Part of the unequal labor market status of minorities must be attributed to pre-labor market discrimination--which results in unequal endowments of human capital--and to differences in labor market behavior. The isolation of that part of minority-majority differences in the quality of employment caused by discrimination is a difficult task. First, it is particularly difficult to identify, let alone measure, all elements of human capital that are relevant to work performance, and second, to evaluate the productivity effects of differences in labor market behavior. These problems are compounded by the fact that the two sources of differentials in employment status may be related. For example, it has been noted that temporary withdrawal from the labor force may lead to an erosion of skills. However, given the type of data that have heretofore been available--principally

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[23] By "productivity characteristics" we mean all attributes of a worker that are functionally related to job performance. Included are innate abilities, formal training, work experience, and labor market behavior. This definition of discrimination is similar to those found in empirical studies of the problem. See, for example, A. Pascal and L. Rapping, "The Economics of Racial Discrimination in Organized Baseball," in Racial Discrimination in Economic Life, edited by A. Pascal (Lexington, Mass.: The Rand Corporation, 1972), p. 120. This defines "prejudicial" as opposed to "informational" discrimination because, in principle, all statistical differences between the majority and minority groups being compared have been taken into account. Prejudicial discrimination is inferred when the differences are unexplained by group characteristics.

cross-sectional surveys--estimation of the magnitude of these effects has been virtually impossible. Insofar as real productivity differences are not taken into account in comparisons of the employment experiences of various subgroups of the labor force, estimates of underemployment will be biased. This holds true of all measures of underemployment, regardless of its source.

Below, a number of contributions to the literature on discrimination will be reviewed within a framework that distinguishes among four possible results for minority-majority differences in patterns of employment. This typology is designed to offset a shortcoming inherent in many of the conceptual and empirical treatments of the problem--the failure to specify the dimension of workers' employment that is affected by discrimination. This specification is important because the mechanisms that perpetrate discriminatory patterns of employment determine the proper remedial action. A cautionary note is in order here. While we have sought to differentiate "prejudicial" from "informational" discrimination, the studies that follow are successful in doing so only to the extent that all "economic" explanations for minority-majority differentials in the quality of employment have been taken into consideration. Given the difficulties inherent in achieving this distinction empirically, the results should be interpreted as reflecting some informational as well as prejudicial discrimination.

Labor market discrimination that causes the earnings of members of a minority group to be less than those of the majority group, although the tasks and productivity characteristics of the workers are the same, may be referred to as wage discrimination. Here,

employers utilize the skills of minority group workers but do not remunerate them according to prevailing standards.[24] The most reliable studies of this type of discrimination tend to discount its importance, while the results of those that find positive evidence of it are inconclusive. For example, an analysis of male-female pay differentials in professional employment within a single establishment failed to find evidence of wage discrimination when on-the-job experience and formal education were included among the determinants of earnings.[25]

Another study compared the average earnings of whites and nonwhites employed in two occupations in a cross-section of establishments in the Chicago area.[26] Nonwhite earnings in one of the occupations, both of which had minimal human capital requirements, were 12 percent less than white earnings. However, this negative effect of race on income was reduced by almost two-thirds when characteristics of the employing organizations were included in the analysis. That is, when the industrial affiliation of the firms and the racial composition of their neighborhoods were taken into account, the differentials appeared

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[24]This corresponds to an economic interpretation of the exploitation of labor. See Joseph Persky and Herbert Tsang, "Pigouvian Exploitation of Labor," The Review of Economics and Statistics 56 (February 1974): 52-57.

[25]Burton G. Malkiel and Judith A. Malkiel, "Male-Female Pay Differentials in Professional Employment," American Economic Review, 63 (September 1973): 693-705.

[26]David P. Taylor, "Discrimination and Occupational Wage Differences in the Market for Unskilled Labor," Industrial and Labor Relations Review 21 (April 1968): 375-390.

to be caused by place of employment rather than a discriminatory wage structure.[27]

By restricting their observation to a single establishment or by including establishment variables in their analysis, these studies avoided the ambiguity of a third study of wage discrimination, an investigation of wage discrimination against Puerto Ricans and Negroes in the New York area. Taken into account were the earnings effects of racial differences in cognitive skills, which provide some indication of pre-labor market discrimination, as well as educational attainment.[28] It found that "17.5 percent of the earnings variation between whites and Puerto Ricans and 13.2 percent of the variation between whites and blacks was rooted in interoccupational differences; the residual of over 80 percent was due to intraoccupational factors.[29] The investigator suggests that much of the intraoccupational differential is attributable to the greater productivity of whites over

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[27] If low-wage firms tend to be located in nonwhite areas, the costs of travel to work and, ultimately, residential segregation rather than discrimination in employment may be responsible for the differentials.

[28] Albert W. Niemi, Jr., "Wage Discrimination against Negroes and Puerto Ricans in the New York SMSA: An Assessment of Educational and Occupational Differences," Social Science Quarterly 55 (June 1974): 112-120.

[29] Ibid., p. 118.

nonwhites in the same occupations. In reality, however, the differences may be due to the over-representation of the minorities in low-wage firms and industries.

Occupational discrimination results when the productivity characteristics of minority group workers exceed those of majority group workers assigned to the same jobs. Or, members of a minority group possessing skills similar to those possessed by members of the majority groups may be assigned to lesser tasks. Empirical evidence indicates that, whatever its causes, the relative occupational status of women is the principal cause of male-female earnings differentials.[30] It is generally accepted that differences in the human capital endowments of the two groups on entry to the labor market fails to explain the differences in work experience. Rather, "the failure of women in the same education-occupation category to rise on the economic ladder over their working lives is seen to be the single largest cause of the male-female differential among whites."[31]

In the light of other findings, we would conclude that women's occupational progress is limited by one or more of the

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[30]It should be noted, however, that the distinction between wage discrimination and occupational segregation is not always clear. In part, this is a result of the inadequacies of current occupational classification schemes. In reference to intraoccupational sex differences in earnings, Victor Fuchs has observed that "if one pushes occupational classification far enough, one could 'explain' nearly all of the differential. In doing so, however, one merely changes the form of the problem. We would then have to explain why occupational distributions differ so much." Fuchs, op. cit., p. 14.

[31]Alan S. Blinder, "Wage Discrimination: Reduced Form and Structural Estimates," The Journal of Human Resources 8 (Fall 1973): 448.

following: (1) characteristics of the occupations which they choose or to which they gain access, e.g., limited opportunities for upward mobility; (2) differential treatment in internal labor markets; and (3) aspects of their labor market behavior not explained by (1). Perhaps the first question that comes to mind is the extent to which sex differences in earnings are attributable to the last set of factors or, more specifically, weaker attachment to jobs and the labor force. Empirical studies have confirmed that number of children, which may be interpreted as a proxy for the weakness of attachment to the labor force, has a significant inverse relationship to the earnings of white women.[32] (It is interesting to note that this effect is negligible in the case of black females.)[33] Nevertheless, the evidence suggests that the principal source of sex differentials is the concentration of female workers in a relatively small number of occupations. Thus, while it required 65 occupations to account for one half of male workers in 1969, it required only 21 for female workers; five occupations accounted for a quarter of female employment.[34] This situation is generally attributed to cultural factors that restrict both the type of labor market preparation and occupations sought by women and

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[32]Ronald Oaxaca, "Sex Discrimination in Wages," in Discrimination in Labor Markets, edited by O. Ashenfelter and A. Rees (Princeton, New Jersey: Princeton University Press, 1973), p. 141-142.

[33]Ibid.

[34]F. Weiskoff, op. cit., p. 162.

the positions for which they are considered.[35] The result is "occupational crowding," wherein a substantial proportion of the labor force competes for limited employment opportunities. Further, the nature of these occupations is probably responsible in part for the weaker job attachment of women and thus provides a "statistical" basis for discrimination.

Although minority group workers perform similar tasks and possess the same productivity characteristics as members of the majority group, they may have lower earnings due to their over-representation in low productivity (measured in terms of value-added per employee) firms and industries. Positive evidence of this pattern of discrimination in employment has been found in a number of studies; it appears to be particularly important in explaining racial differences in earnings. For example, an extensive analysis of the relationships among discrimination and various characteristics of industries concluded that:

> Discriminatory practices seem to be influenced substantially by occupational, industrial and locational factors. These estimated measures of racial discrimination are generally higher in more skilled occupations, more profitable industries, and in industries more heavily concentrated in the largest metropolitan areas.[36]

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[35] See, for example, Harriett Zellner, "Discrimination against Women, Occupational Segregation, and the Relative Wage," American Economic Review 62 (Papers and Proceedings, May 1972): 157-160.

[36] William S. Comanor, "Racial Discrimination in American Industry," Economica 60 (November 1973): 378.

The evidence of a positive relationship between discrimination and profitability was substantiated by another study which found that the proportion of nonwhites in white collar jobs is inversely related to the market power of industries.[37] As an explanation, it has been hypothesized that monopoly profits are used to pay a premium for majority group workers.[38] The notion that firms may be willing to forego profits in order to exclude minorities from their labor forces is also implicit in the model of discrimination advanced by Gary Becker.[39] That disparities between the economic status of whites and nonwhites are explained by attitudes of the majority as well as real interracial productivity differences is attested to by a study of the occupational status of Negroes relative to whites in 45 metropolitan areas and 67 industries. "The most important factor in explaining differences in the indexes among areas was the citizens' attitudes towards equality for Negroes, for which we used the percentage voting for Wallace in 1968 as a proxy."[40]

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[37]William G. Shepherd, "Market Power and Racial Discrimination in White Collar Employment," The Antitrust Bulletin (Spring 1969): 59-67.

[38]Armen A. Alchian and Reuben A. Kessel, "Competition, Monopoly and the Pursuit of Money," in Aspects of Labor Economics (Princeton, New Jersey: National Bureau of Economic Research, 1962), pp. 157-183.

[39]Gary S. Becker, The Economics of Discrimination, 2 ed., (Chicago: The University of Chicago Press, 1971).

[40]Barbara R. Bergmann and Jerolyn R. Lyle, "The Occupational Standing of Negroes by Areas and Industries," Journal of Human Resources 6 (Fall 1971): 411.

Finally, members of minority groups may have higher rates and longer durations of unemployment than members of the majority group in the same industry-occupation cells.[41] For example, the discriminatory impact of the "last hired-first fired" rule that generally governs layoffs indicates that the hiring of minorities lags that of white males during upswings in employment. In a sense, this condition lies outside the scope of this report, which is not concerned with unemployment per se; however, the greater sensitivity of minority workers to aggregate labor market conditions is likely to affect the quality of their employment in several ways: their upward progress within internal labor markets is interrupted, they may suffer a real erosion of their acquired skills, and employers may interpret recurring periods of unemployment as a sign of weak labor force attachment.

Other Causes of Micro-underemployment

In addition to search costs, the costs of mobility can be expected to rise as the job seeker is more removed from a job vacancy by physical distance. Intervening job vacancies (which may be inferior but better than a worker's current activity) raise the opportunity cost of continued search for jobs further away from his present position.[42]

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[41] For a theoretical treatment of this form of discrimination, see Stephen J. Carroll and John E. Rolph, A Stochastic Model of Discrimination (Santa Monica, Calif.: The Rand Corporation, 1970).

[42] See Harry W. Richardson, Regional Economics (New York: Praeger, 1969), p. 299.

The costs of movement (mobility) across distance are added to less precise labor market information, or added search costs, as the distance between the vacancy and the potential applicant rises. These costs at some point outweigh any benefit a vacancy may offer. Generally, empirical evidence suggests that the higher the skill level involved, the more geographic mobility is undertaken; the older the individual, the less likely he is to migrate; females are less likely to move than males; single people move more readily than married couples.[43] These empirical findings illustrate the costs and benfits of migration human capital investments, referred to in Chapter 2. The physical separation of people from job vacancies, then, prevents the full utilization of skills, and the result is underemployment.

Women are faced with more severe geographical problems than men since the married woman typically follows her husband. The husband moves to maximize income while the wife takes what she can get. The clear implication here is that women, from this factor alone, will suffer more underemployment than men.[44]

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[43] An excellent review of mobility studies is found in Herbert Parnes' "Labor Force Participation and Labor Mobility," Industrial Relations Research Association, Research Studies 1 (1970): 1-77.

[44] When skilled husbands take jobs in small regional markets where professional jobs exist, the result is often conspicuous underemployment for their skilled wives who are trained in other fields. Sookon Kim, Roger D. Roderick, and John R. Shea, Dual Careers: A Longitudinal Study of Labor Market Experience of Women, Volume 2 (Columbus, Ohio: The Ohio State University, Center for Human Resource Research, 1972) show that married women are less job-mobile than others (p. 58). They go on to show that job-movers, people who change firms, "experienced greater absolute gains in rate of pay than did nonmovers, except in the case of whites (women) earning $3.00 per hour or more in 1967." Women who are married have a dual problem--they lose out in general because they are less mobile and lose out in particular when a husband's mobility forces them to abandon a $3.00 per hour job and take their chances.

Because of family responsibilities, many women desire part-time work. However, not many professional occupations provide part-time work options so that those who are professionally trained can utilize their skills and avoid underemployment. A typical case is that of the professional woman who wants to (needs to) work part-time; the jobs available are far lower in the job hierarchy than the vacancies she might find if she were committed full-time to the labor force.

We could find little evidence to support the view that part-time workers are less productive than full-time workers, or that they progress slower in their professional work. Professional part-time work would keep skilled women in contact with "their type" of job and prevent skill erosion from taking place. There is no particular reason why career commitment cannot be part-time, whether reference is to men or women. In any case, the absence of part-time jobs to suit the skill distribution of women, who are generally as educated as men, causes underemployment.

The same form of underemployment is evident for students who are professionally trained, except for actual degrees, but who cannot obtain professional part-time work. Perhaps most of this underutilization is voluntary. Because it is transitory in nature, however, it is less severe than the case of women.

Above, we suggested that employers tend to attribute to all women their group's tendency to have relatively high turnover rates. As noted, women's turnover rates may be higher because of the jobs they get, or it may be that particular jobs are relegated to them because they expect to be in the labor market only temporarily.

Without resolving that issue, it is important to note that weak labor force attachment will leave the individual at a disadvantage vis à vis competitors for vacancies. Again, this issue is in part an information problem. The woman who is not committed to a career plan or path will find it difficult to get entry jobs which utilize her skill. In addition, she may not be willing to bear the additional search costs necessary to find jobs which the continuously employed woman can find more easily. To the extent that professional women are not career-oriented, their skill may erode over time, and the extent of their underemployment is less clear.

Causes of Macro-Underemployment

Thus far, we have discussed some of the factors which may result in micro-underemployment. The problem was not with a particular skill or skill cluster or with the demand for the occupational cluster in which a skill is usually utilized. Rather, some real characteristic of the individual, or a characteristic perceived by the employer, caused the underemployment. Macro-underemployment differs in that the underemployment is not specific to the individual. In this case, a whole occupational group in which a particular skill or bundle of skills is usually found experiences a lower rate of return relative to other skills.

Macro-underemployment is not entirely independent of micro-underemployment. Since occupational groups or skill groups are not mutually exclusive (the degree of association is technically measured,

by cross elasticity of demand),[45] recession in one occupation means spill-over into other occupations (for example, engineers competing for draftmen's jobs). Those individuals who tend to suffer micro-underemployment will suffer a greater share of the burden of the increased competition. (A parallel appears in the case of unemployment statistics, where certain cohort rates rise disproportionately to the rise in the average unemployment rate.) If overall demand for a skill is strong, employers will tend to ignore factors they normally might use to discount human capital.[46]

Macro-underemployment problems are best discussed under the headings of demand and supply. The former refers to the nature of the production process and levels of product demand that determine a firm's labor requirements. The latter refers to how individuals make choices with respect to education and occupation and how they adjust to changes in the demand for labor.

Macro-underemployment and the Demand for Labor

As noted in Chapter 2, the labor market is very fluid. The demand for skills is not static but continuously changes. Employer's demands for skills will vary for two reasons:[47] (1) The technical

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[45] That is, the proportionate change in quantity of type A labor demanded (Q_A) relative to a proportionate change in wages for type B labor (W_B).

$$\frac{\partial Q_A / Q_A}{\partial W_B / W_B}$$

[46] Hiring of the disadvantaged was strong in 1968 when overall demand was high and unemployment was low.

[47] Reference here is to labor demand curve shifts, not movements along a demand curve in response, say, to wage changes.

process of production changes; that is, new forms of physical capital replace vintage capital and require a different complementary bundle of labor skills. The result is a skill sector's mini-recession, usually with little chance of an upswing. What we refer to here is the displacement of skills, with jobs being replaced by mechanization. Automation, then, is a cause of underemployment. (2) The demand for labor is a derived demand--derived from the demand for goods and/or services it produces.[48] If, for any reason, the overall demand for the product shifts downward,[49] especially if the shift is not temporary, then the demand for the skill or cluster of skills involved is affected adversely (given a fixed supply). For example, occupations such as engineering, which are dependent in important respects on government expenditures through defense contracts, can very quickly experience a labor market glut soon after a period of shortage.[50] This is a particularly volatile occupation, but other skills face similar "ups" and "downs" as a result of fluctuating market demand for the products or services they produce.[51]

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[48] The demand for labor reflecting (1) and (2) above is defined as marginal product of labor times the price of the product produced by labor (MP · p = demand for labor). Technical factor input changes shift MP; the demand for goods that labor produces changes p and, hence, the demand for labor.

[49] The demand need not actually shift down but could increase less rapidly than expected; the result is the same.

[50] Glen C. Cain, Richard B. Freeman, and W. Lee Hansen, Labor Market Analysis of Engineers and Technical Workers (Baltimore: John Hopkins Press, 1973).

[51] The teaching profession is less volatile, but shortages and then gluts have appeared in the last decade.

In some cases the relative decline in the position of an occupation (skill) is temporary,[52] but it fares poorly relative to other occupations in a general downturn of the economy because the related product has a high income elasticity of demand.[53] Durable goods which require major expenditures, such as appliances and automobiles, are income elastic relative to food commodities (except for luxury foods). Individuals whose skills are tied to high income elasticity products can be expected to suffer relatively more underemployment, other factors the same, when over-all income falls.

All of these changes on the demand side, which leave skill groups (occupations) in a relatively less competitive position vis à vis other skill groups, result in macro-underemployment. The severity of the problem will depend on (1) how transferable the skills are (cross elasticity of demand among skills), (2) how rapidly the underemployed adjust their skills,[54] and (3) how permanent the changes in demand for labor are.

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[52]This is in contrast to the more permanent declines as a result of automation.

[53]The income elasticity for most goods (normal goods) is positive. Income elasticity is defined as the proportionate change in the quantity of a good demanded (Q_D) over the proportionate change in income (Y), i.e.,

$$\frac{\partial Q_D / Q_D}{\partial Y / Y}$$

[54]Those who cannot afford to reinvest in new skills (the aged, the poor, etc.) will suffer the most.

Macro-underemployment on the Supply Side

What has been described above as a demand problem is, in fact, both a supply and demand problem. That is, if supply of labor could respond rapidly and effortlessly to changes in demand for labor, there would be little underemployment. But the response of labor supply to changes in demand is sluggish.[55] In this context, the rigidity of labor supply or labor immobility is a cause of macro-underemployment.

Individuals in skills or occupations adversely affected by demand shifts may not move to other jobs because their skills are too narrow; retraining, which can represent a considerable cost, may be required. As mentioned in Chapter 2, human capital investments in education become irreversible to a large extent due to cost (time) factors. It is relatively easy to change career aspirations and jobs at a young age; however, the older Ph.D., male or female, with a family does not have the same latitude for change, and cost is the constraint. The result of this immobility in the face of declining demand will often be underemployment rather than retraining; the individual is "locked in."

Another cause of macro-underemployment is the lag between market signals that indicate declining demand for a skill and reaction to that signal as revealed by relative declines in the number of graduates trained in that skill. The cause of underemployment in this case is partly one of inadequate information. Another factor in the apparent lag in supply adjustment is that education is in part

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[55] An added complexity is that demand reacts to change in supply and vice versa.

consumption. Moreover, students do not necessarily follow the market but rather follow their peers. A classic example of the inflexibility of supply in response to signals from the market is the teaching profession, especially in elementary education. Long after the peak in enrollments passed in the 1960s and indications of glut appeared, universities were still expanding programs to train elementary school teachers, the result being a significant excess supply of teachers, some of whom are now either out of the labor force or are still in the labor force but underemployed.

Other things the same, upward shifts in the supply of labor to an occupation or skill mean more underemployment. Other things the same, downward shifts in the demand for skills or occupations mean more underemployment. Since whole occupations or skills are involved, we call this macro-underemployment. To the extent that labor market forecasting is improved to warn of relative declines in demand earlier and to transmit this information more rapidly to supply sources, the problem can be reduced. We do not, however, want to leave the impression that forecasting is easy; to the contrary, there are numerous problems associated with the procedure.[56]

Summary

The purpose of this chapter has been to identify the probable causes of underemployment. These included inadequate labor market information, prejudicial discrimination, and barriers to mobility.

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[56]See Cain et al., op. cit.

Although the authors are inclined to regard the information problem as the dominant source of underemployment, the ordering of the discussion does not reflect any a priori judgment as to the relative importance of these factors. In the following chapter some methods of estimating the magnitudes of their effects are described.

In the final chapter we make a number of recommendations, some of which are aimed at education policy makers. We suggest some education-oriented measures that might be taken which can be expected to reduce underemployment problems as they have been described. However, until satisfactory empirical data are available for identifying the relative importance of various sources of underemployment, the priority of the recommendations is uncertain. The causes of underemployment are diverse; solutions to the problem of underemployment are therefore also expected to be diverse.

CHAPTER 5

THE MEASUREMENT OF UNDEREMPLOYMENT

Introduction

The task of this chapter is to discuss alternative means of estimating the level and character of underemployment as defined in this study. Three approaches are examined. These measure underemployment in terms of (1) technical underutilization, or the "real" lack of correspondence between workers' skills and job requirements; (2) differentials in the rates of return on human capital investments; and (3) differences in levels of job satisfaction. Each bears on a different aspect of work, and it is difficult to make any *a priori* judgment as to the degree to which they may be empirically related. For reasons presented below, the second approach is regarded as being the most promising in terms of its current feasibility and adequacy as a measure of underemployment.

Technical Underutilization

A meaningful analysis of the degree to which workers' current skills or investments in training are effectively utilized would have two prerequisites, neither of which is currently available in a satisfactory form and both of which are costly undertakings. These are: first, a system for assessing and classifying jobs and workers,

respectively, by their required and acquired skills; and second, a means of collecting data within the framework provided by such a system. Two approaches are available for fulfilling the latter requirement. Sample surveys could be conducted to determine the degree of correspondence between job requirements and workers' skills for target subgroups of the labor force. Or, existing information channels could be modified to gather the required data. For example, a brief questionnaire on workers' characteristics might be attached to the withholding statements forwarded to the Social Security Administration by employers. This type of data base would at once provide a means of measuring both the "real" and "pecuniary" dimensions of underemployment. A more fundamental issue, however, has to do with the design of a scheme for the classification of occupations and workers. Due to the potential usefulness of such a system in pursuing more active labor market and educational policies, this subject has received considerable attention. Its bearing on the underemployment problem has been referred to elsewhere in the study; our concern here will be with the shortcomings of current schemes and the proposed alternatives.

The system for the classification of occupations used in the United States, The Dictionary of Occupation Titles (D.O.T.), was designed to assist the U. S. Employment Service and state employment agencies in their placement functions.[1] In its latest edition, it

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[1] U. S. Department of Labor, U. S. Employment Service, Dictionary of Occupational Titles, Vol. 1, Definitions of Titles, 3rd ed. (Washington, D. C.: U. S. Government Printing Office, 1965).

uses a six-digit decimal system to codify some 22,000 occupations.[2] The first three digits--the key element in the system--define jobs by criteria that are adapted to the nature of the broad occupational groups in question. Thus, "professionals" are subdivided according to "subject matter," whereas "machine trades occupations" are disaggregated by "work field, material, or product."[3] The last three digits may be interpreted as skill rankings within the occupations so defined. These provide a measure of the nature and level of job involvement with "people, data, or things" according to a hierarchy of descriptive verbs, such as "sythesizing, coordinating," etc.[4]

This system is not used as a basis for gathering job statistics. Even if it were, it would fail to provide a satisfactory source of information for estimating the skills or education used in production. This shortcoming stems from the nature of the criteria used to group jobs. As one critic has pointed out, these criteria are aspects of the technological relationship of jobs to production rather than the interoccupational homogeneity of skill requirements.[5]

The framework used by the Bureau of the Census and the Bureau of Labor Statistics for gathering employment data by jobs and workers' characteristics subdivides the labor force into 296 occupations within

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[2]James G. Scoville, Manpower and Occupational Analysis: Concepts and Measurements (Lexington, Massachusetts: Lexington Books, 1972), p. 18.

[3]Ibid., Table 2-1, p. 19.

[4]Ibid., p. 22.

[5]Ibid., p. 21.

11 major groups.[6] These groupings reflect the relative socioeconomic status of occupations rather than similarities in the type or level of training they require.

Among economists who have dealt with the subject, there is general agreement on the deficiencies of present classifications of jobs and workers. However, agreement prevails in recognition of the problem rather than the nature of the cure. At issue are the criteria that should be used for aggregating jobs, the alternatives being the educational requirements and the specific task content of occupations.

In a critique of the rate-of-return approach to evaluating the utilization of human resources, Eckaus has suggested that:

> The following information is necessary [for computing education requirements]: (1) a complete listing of employment, sector by sector, in job categories which permit the distinction of the differential education and training requirements for each sector; and (2) a description for each job category of the amounts of the various types of education which are required for an average level of performance on the job.[7]

Largely for the purpose of illustrating the type of system that he envisages, Eckaus made use of two admittedly less than perfect sources of information to estimate the years of education and training effectively required by industrial sectors of the economy. The schooling requirements were adapted from a Department of Labor study of

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[6] In a less refined version used by the Bureau of Labor Statistics, the 11 occupational groups are subdivided into only 160 occupations. U. S. Department of Commerce, Bureau of the Census, U. S. Census of Population: 1960. Subject Reports, Occupation by Industry, Final Report PC (2) -7c (Washington, D. C.: U. S. Government Printing Office, 1963).

[7] R. S. Eckaus, "Economic Criteria for Education and Training," The Review of Economics and Statistics 46 (May 1964): 183.

Estimates of Worker Trait Requirements for 4000 Jobs.[8] This study contains estimates of the Specific Vocational Preparation (SVP), which reflects typical apprenticeship and on-the-job training requirements, and the General Educational Development (GED), or cognitive skills, required for average work performance in the 4,000 occupations. The GED categories were converted into approximations of equivalent school years of education. Distributions of the labor force by industry and job category in 1940 and 1950 were obtained from Census data. These permitted the author to estimate the distribution of industrial labor force groups by their general and specific training requirements. Given reliable projections of sectoral growth rates, an educational requirements-industrial group matrix of this nature would yield estimates of the educational content of future production.

The approach proposed by Eckaus is open to a number of criticisms. For one, it is not clear that the number of years of specific vocational preparation--on-the-job training, apprenticeships, promotion schedules--required for access to occupations is determined any more "objectively" than are relative earnings and rates of return on human capital. Essentially the same difficulty arises in estimating the formal educational requirements of jobs. A classification system that emphasizes quantity and type of education rather than specific skill requirements encounters the risk of institutionalizing "credentialism." Most important, perhaps, it tends to accept the skill content of past schooling programs as given.

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[8] Estimates of Worker Traits Requirements for 4000 Jobs (Washington, D. C.: U. S. Government Printing Office, 1956).

> Perhaps one reason why most occupational classificatory schemes include education and training among the criteria for grouping together occupations is the reluctance to face up to the difficulties of job analysis, the science of listing the tasks involved in an occupation.[9]

The type of scheme recommended by critics of the educational requirements approach would conform to guidelines set forth by John Dunlop.[10] Following these, occupations would be aggregated by their "job families," and "skill content." Job families, or skill clusters, are defined as groups of occupations within which there is a high degree of worker mobility and, by implication, transferability of skills. Within these major groups, specific occupations would be ranked according to the breadth and complexity of the tasks and hence the specific skill requirements they impose on workers. For example, the system proposed by one researcher in this area would group occupations into approximately 16 job families, such as "education," "vehicle operation," "administration and organization," etc., and into five intrafamily levels of skill.[11]

The crucial characteristic of an occupational classification scheme constructed along these lines is that it would reflect the degree of substitutability of skills among jobs from the perspective of both employers and workers. This scheme is closely related to the

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[9]Eckaus, op. cit., p. 183.

[10]Glen Cain, W. Lee Hansen, and Burton A. Weisbrod, "Occupational Classification: An Economic Approach," Monthly Labor Review (February 1967): 50, footnote 6.

[11]See Roger H. Bezdek and Barry Getzel, Alternate Forecasts of the Job Content and Skill Requirements of the American Economy in 1980, Mimeograph (Urbana, Illinois: Center for Advanced Computation and Institute of Labor and Industrial Relations, University of Illinois, 1971).

notion of cross-elasticity of demand referred to previously.[12] However, since this concept does not readily lend itself to estimation on the scale required for a classification of occupations, job families would be defined by observed patterns of occupational mobility. That is, the probability of movement among occupations would be used as a standard for distinguishing among broad occupational groups.[13]

Rate of Return on Human Capital Investment

Measuring underemployment by comparing skills with technical requirements of jobs would be ideal if data were available for such a comparison. At present, however, this method is not feasible. Given our definition of underemployment as presented in Chapter 3 and our subsequent discussion, we specified a link between the extent to which an individual utilizes his/her skills and his/her resultant rate of return on an investment in education or training.

The reasoning behind the aforementioned connection is as follows. Human capital investment increases the individual's productive potential by providing him/her with skills applicable to certain occupations or clusters of occupations. The more closely those skills are matched with job content, other factors the same, the higher the individual's productivity is expected to be. Because productivity in work is related to remuneration in work, remuneration and the rate

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[12] See Chapter 2, footnote 19.

[13] For an example of one of the few studies of patterns of interoccupational mobility, see Robert C. Dauffenbach, "The Structure of Occupational Mobility in the U. S.," Manpower Research and Development Projects, United States Department of Labor, 1973.

of return on human capital are reflections of the utilization of skills, other things the same.[14] But how can the rate of return be calculated? What data sources exist to enable us to empirically approximate the "other things the same" assumption and estimate returns?

Rate of Return Analysis

The internal rate of return on an investment in human capital is that rate of return which will equate the stream of costs and benefits attendant to that investment. Symbolically, the internal rate of return is that value of r which sets the following expression equal to zero, where B_t equals net benefits.[15]

$$\sum_{t=1}^{n} \frac{B_t}{(1+r)^t} \qquad t=1...n \text{ periods}$$

Given unlimited longitudinal data, the calculation of r is simple enough. However, the identification of costs related to investments and attendant benefits is very difficult due to data constraints. In most cases we must be content with cross-sectional data or sometimes ex post data when we would like ex ante information. For example, current age-earnings profiles are used to make judgments about ex ante rates of return; years of education is used to reflect the

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[14] Of course, marginal products do not always equal prices (wages), and there is controversy over the productive role of education as distinguished from other factors which determine wages.

[15] For discussion of the rate of return concept, see Teh-wei Hu, Maw Lin Lee, Ernst W. Stromsdorfer, and Jacob J. Kaufman, A Cost-Effectiveness Study of Vocational Education (University Park, Pa.: Institute for Research on Human Resources, The Pennsylvania State University, 1969), p. 35.

investment; and quality of training and work experience are typically ignored, although both are significant elements of human capital.[16]

Other questions arise in the estimation of rates of return to education: how to identify earnings related to investment in contrast to earnings attributable to family background, for example; how to control for other variables which may influence earnings; and how to adjust earnings for labor force participation and hours worked in order to reflect more closely real rates of return. These are problems common to any research effort aimed at estimating rates of return to human capital. The point is that r is biased to the extent that these factors are not controlled for since it does not measure the true return to the educational investment or, therefore, the true utilization of skills acquired through education.

In short, to calculate rates of return on investments in education and training, considerable data are required, and the researcher must control for numerous factors which influence earnings in order to identify the effects purely attributable to education and training.

If unlimited data detail were available to control for the factors mentioned above, underemployment could be identified where an individual's (or cohort's) r was less than $\bar{r}$ (a reference group's average rate of return, or the numeraire). Since there are data

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[16]Training expenditures by industry are probably one half to two thirds of public education expenditures. See Jacob J. Mincer, "On-the-Job Training: Costs, Returns and Some Implications," Journal of Political Economy (Supplement, October 1962): 50-79.

constraints, an individual or a group of individuals could arbitrarily be defined as underemployed if his/her (its) rate of return was below one-half $\bar{r}$ or the median r for the reference group. This arbitrary measure would avoid the overestimation of underemployment given the limited data.

A Suggested Data Base

By raising the problem of control, we now have a better idea of what sort of detail a data base should have if reasonable estimates of rates of return on education and training are to be made. To the extent that the estimates are inaccurate, the estimate of utilization of skills is also inaccurate. We turn now to a data base which appears to offer considerable potential for exploring underemployment issues--the Project TALENT data base.[17]

The Project TALENT data base was developed from a nationwide sample of 400,000 high school students in four grades (12, 11, 10, and 9) in 1960. Detailed follow-up questionnaires after one year, five years, and 11 years provide considerable longitudinal information on earnings, labor market experiences, and education after high school. This longitudinal data can be combined with the detailed 1960 socio-economic data, including parent's education and occupation; quantity and quality of education (the latter from school questionnaires); ability measures; and other characteristic data. It is precisely this type

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[17] See Appendix A for a more detailed description of Project TALENT.

of information that is required to improve our estimates of the utilization of education.

Empirical Approaches

Given the Project TALENT data on earnings, education (from which direct costs can be estimated), and a wide range of socioeconomic variables, it would be possible to estimate rates of return for a wide range of labor force cohorts by optional summation of individual earnings data.

With the above-mentioned data base we would expect that earnings differences among individuals in the sample are related to (1) the level of education or skill obtained and, therefore, the cost of the investment in education;[18] (2) the curriculum, program, or type of education (skill) completed within a given educational level (within a level, costs may or may not differ by type of education); and (3) the degree of utilization of skills for those individuals with similar skills whose costs or investments are equal. That is, earnings will vary among amounts or levels of education, among curriculums within those levels, and within each curriculum.

The definition of underemployment used in this paper is not primarily concerned with variation in earnings as a result of more or less education but rather with differences in earnings within levels and within types of education. Macro-underemployment is related to

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[18] Level can be defined here as years of education and training completed, or a division into levels such as high school, non-high school, and college.

earnings differences among types of education, or (2) above. Note that most cost/benefit or cost/effectiveness studies are designed to identify differences in earnings under (1) and (2) above but not (3). The major focus in this paper has been on micro-underemployment; corresponding empirical work would test (3), seeking an explanation of the variance in earnings or rates of return for individuals who complete the same education or have the same skill.

Empirical tests using the Project TALENT data base should cover the three factors identified above, with emphasis on (3); that is, an explanation of earnings differences among sample elements with homogeneous skills. Cohort rates of returns to human capital should be compared and variances among cohorts studied.

We suggest two techniques which would be useful in identifying causes of underemployment by explaining the variation in earnings within homogeneous skill groups.[19] One technique is multivariate regression analysis; another is a relatively new computer technique called Automatic Interaction Detector (AID).[20] The former technique is useful because it allows the researcher to approximate the "other things equal" assumption. In this context, it would allow observation of the independent effect of education on earnings, holding other well-specified variables constant. AID analysis is useful when the researcher expects

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[19]The remarks below are designed to be illustrative of what could be done. They are not intended to represent a rigorous theoretical model.

[20]For a primary source on this technique and its application, see John A. Sonquist, Multivariate Model Building (Ann Arbor, Michigan: Institute for Social Research, 1970).

that there are many variables which independently influence earnings but which also interact; AID indicates which interaction terms should be specified. For example, the presence of a young child may increase labor force attachment for a mother in a low-income family, while the presence of a young child may have the opposite effect on a mother in a high-income family. Interaction effects, of course, can be handled in the normal regression approach providing that one knows which variables to combine. When a number of independent variables are present, however, and a priori knowledge of the important interactions is limited, one would soon run out of degrees of freedom as the range of possible interactions are included as separate terms. These problems are not so important when a clear theoretical picture is available. But for many, perhaps most, behavioral studies, the state of the art is not developed to the extent that interaction relationships and their form can be identified adequately prior to data analysis.

The AID technique

> employs an asymmetrical branching process to subdivide the original sample into a series of subgroups constructed so as to facilitate prediction of the value of the dependent variable least error.[21]

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[21] Irma Adelman and Cynthia Taft Morris, "Analysis of Variance Techniques for the Study of Economic Development," Journal of Development Studies 8 (October 1971): 96.

How would AID be useful in analyzing variation in earnings differences within common education cohorts?[22] From the Project TALENT data we can identify homogeneous educational backgrounds, extensive socioeconomic characteristics, and earnings for individuals. For a given homogeneous education group, suppose the independent variable is full-time-equivalent weekly earnings, and we wish to identify the sources of variation in those earnings across the sample. The AID algorithm will not only select the best predictor variable but will also indicate how the other independent variables interact to influence earnings. The AID algorithm, in contrast to the usual regression technique, can handle highly nonlinear interactions and does not assume independent variables to be uncorrelated or additive in effect. AID is also useful for dealing with qualitative variables, such as sex

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[22]The AID procedure provides for a sequential one-way analysis of variance where, initially, the total sample of data is scanned to find that dichotomy of any eligible independent variable which, when partitioned, results in the lowest within-group sum of squares for the dependent variable. Total sum of squared deviations of the dependent variable is equivalent to the total variation of Y in the regression model, and within-sum of squares is equivalent to the unexplained variation in Y, while between-sum of squares is equivalent to the explained variation in Y in the regression model. Hence, that X which, when dichotomized by its intravariable classes, gives the smallest within-group sum of squares for Y is equivalent to finding that X which accounts for the greatest variation in Y (or in terms of the regression model, contributes most to the coefficient of determination, R^2). When a variable is split on the basis of its classes, the AID procedure considers all possible splits and selects the partition which contributes most to the reduction of the unexplained variance in Y.

Having completed the first partition of the data, the AID analysis goes on to consider the next eligible group with the largest within-group sum of squares or unexplained variance for the dependent variable. This group is then split into two on the same basis as the first partition was made, as described above. This iterative process continues until there are no eligible groups left to be partitioned.

classification or marital status variables, in contrast to continuous variables.

Since much of the socioeconomic data in Project TALENT is qualititive in nature and since extensive interaction of independent variables can be expected, the AID approach is recommended in addition to regression analysis.

If variables such as IQ are identified as primary sources of variation in earnings, then the skill variable may not be as homogeneous as the educational categories imply. Differences in ability are not a cause of underemployment. Alternatively, if variation in earnings appears significantly related to, for example, sex of the individual or region, occupation, or industry of employment, the variation may be indicative of underemployment.

Initially, three types of regressions should be carried out. First, a regression of earnings (E) on three sets of independent variables: endowed skills, X_j, where j represents particular skill traits, including ability, formal education, and quality of education; Z_j, where j represents nonproductivity-related characteristic variables; and I_j, which could represent interaction terms (between X_j and Z_j or within X_j and Z_j) suggested by the AID analysis. This analysis would be aimed at identifying how skill differences, as compared to nonskill factors, influence earnings; in addition, interaction effects could be identified.[23]

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[23]The above discussion could be formalized by the following equation:

$$E_i = a_o + b_j X_{ji} + c_j Z_{ji} + d_j I_{ji} + e_i$$

where i = 1...n observations
j is the number of variables in X, Z, and I
X's are skill characteristics, Z's are nonskill-related characteristics, and I's are interaction terms.
The coefficients b_j, c_j, and d_j and their standard errors indicate the strength of the independent variables X, Z, and I in explaining variation in the dependent variable E.

Second, subregressions of the form described above should be conducted for subsamples (for example, by sex or race) to see how the relationship between E and X, Z, and I varies among cohorts. Unexplained differences among cohorts may, for example, indicate underemployment due to discrimination.

Third, controlling for education (both type and level), subregression analysis of the form described above could be used to identify differences in earnings within type of education. To the extent that skill is homogeneous in these subregressions, market imperfections or barriers to full utilization of skills could be identified, as reflected by earnings differences.[24]

We have attempted to illustrate what may be the best empirical approach that provides an opportunity to identify underemployment and estimate its extent and causes. Below a third possible technique for identifying underemployment is briefly described.

Job Satisfaction

The adequacy of job satisfaction as a measure of underemployment, in the sense that underemployment is used in this report, is questionable. We would suggest that it complements rather than acts as a proxy for the technical and rate-of-return dimensions of underemployment.

It has been suggested that job satisfaction for workers with a given level of educational attainment will increase with the educa-

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[24] Probably a reduced-form simultaneous regression equation approach would have to be used in all of the above estimates.

tional requirements of their work.[25] This implies that the relative level of job satisfaction might be used to estimate the gap between acquired and required skills, or, as it has been called, the "educational wastage" gap.[26] This approach would encounter a number of problems.

First, attitudes toward work are a subjective aspect of employment whereas, in principle, degrees of skill utilization may be observed objectively. The former must be estimated either by direct interview--a technique that is prone to bias, particularly when the variables are impressionistic--or an index of one or more proxy variables. If the second approach is utilized, two links must be established: one between the index and the actual relative job satisfaction, the other between relative job satisfaction and skill utilization. Further, if earnings were included in the index of job satisfaction, these would provide a more direct estimate of underemployment via the rate-of-return approach.

While the relationship between educational attainment and job satisfaction may be of interest for other purposes, it has limited value as an indicator of the underutilization of workers' productive capacities. Skill is not solely a function of educational attainment; other worker attributes may be expected to have an impact on work performance. Indeed, the major effect of some types of schooling may

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[25]Arne L. Kalleberg and Aage B. Sørensen, "The Measurement of the Effects of Overtraining on Job Attitudes," Sociological Methods and Research 2 (November 1973): 215-238.

[26]Eckaus, op. cit., p. 183.

be to raise aspirations with respect to occupational attainment rather than to impart functional skills. To the degree that this holds true, measures of job satisfaction will overestimate actual underemployment.

CHAPTER 6

RECOMMENDATIONS

Introduction

The recommendations provided below are suggestions for policy action aimed at reducing the underemployment of human resources. These recommendations are divided into two parts. First, we provide some general recommendations which are empirically oriented. These recommendations come directly from the substance of the report. Second, we make some additional suggestions which are education policy oriented. Given the largely conceptual nature of this study, we have not analyzed each of these recommendations as to their relative costs and benefits. However, action on these suggestions are consistent with the goal of reducing underemployment.

The thrust of this report has been that while some broadly defined sources of the underutilization of education and training may be identified, their relative or absolute importance is unknown. Consequently, the distribution of underemployment among labor force groups, be they defined in terms of occupation, educational attainment, demographic characteristics, or other attributes, is also unknown. We would strongly recommend that efforts be undertaken to empirically specify the causes and impact of underemployment. These would contribute to the formulation of corrective action in a number of ways. As already noted, the results of received work in this area are usually

too general to assist in the design of effective remedial measures.[1] The empirical approach suggested in this study would be intended to contribute to the correction of this shortcoming.

Quantification of the problem would permit the ranking of causes of underemployment by the magnitude of their effects. This ranking could be weighted by both the social significance of the causes and their effects and the costs and returns attached to their correction. For example, it might be found that individuals tend to be underemployed during the initial stages of their working lives. However, in the light of studies indicating that a "trial work period"[2] is intrinsic to the "crystallization"[3] of occupational choice, it may be decided that policy action would be more effectively directed at subgroups of the labor force other than the young. Or, the "value" of underemployment due to discrimination might be found to be relatively insignificant. But, for social and political reasons, its ranking in the order of priorities for public action might be high. By the same token, social and political policy may condone some forms of economic inefficiency due to underemployment. For example, a partially "dormant" defense establishment is considered to be a political necessity.

That costs would be attached to reducing underemployment needs to be emphasized. Again, the ordering of priorities within an

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[1] Empirical work related to underemployment is probably most extensive in the area of discrimination. Yet employer practices and aspects of labor market behavior that give rise to minority-majority group differentials in labor market performance are obscure.

[2] D. C. Miller and W. H. Form. Industrial Sociology (New York: Harper and Row, 1951).

[3] Crites, op. cit., p. 155-213.

underemployment policy is likely to be altered when these are weighed against the returns associated with specific measures. It has been pointed out that some underemployment is inherent in the operation of an imperfect economy. Indeed, some underemployment may be economically rational. A situation where the earnings effects of migration would be positive but less than the costs of relocation is a case in point. In brief, the costs of reducing some forms of underemployment may exceed their returns.

Arriving at general estimates of the costs of programs designed to reduce underemployment should be a fairly straightforward issue. These may be expected to increase with (1) the technical complexity of the measures, (2) the level of involvement in the labor market required of the government, and (3) the extent to which the sources of underemployment in question are a product of culturally established behavior and values rather than misinformation. Where returns are specified in economic terms (e.g., higher earnings, less wastage of acquired skills) their estimation also represents a relatively clear issue. However, attaching values to the noneconomic considerations noted above is apt to be more difficult.[4]

In Chapter 4, the authors examined two approaches to the measurement of underemployment in terms of their feasibility. They

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[4]When the benefits of a program are difficult to express in monetary terms, cost-effectiveness analysis provides an alternative to cost-benefit analysis. In cost-effectiveness analysis, indices of nonmonetary variables are used to measure program outputs.

would define and estimate underemployment by (1) the "gap" between workers' skills--which are assumed to be a function of their human capital endowment--and job requirements, and (2) variances in the rate of return on investments in schooling and training. The discussion was cast in terms of the ideal versus the currently feasible. Thus, while the first method would be the more optimal for the purposes of labor market and educational policy making, the shortcomings of current systems for the classification of jobs and workers render it impracticable. The complexity of the tasks that would be involved in designing an occupational classification scheme in the nature of that described in Chapter 4 render this a long-term project. The rate-of-return approach provides a more immediate source of the information that would be required for formulating an underemployment policy.

General Recommendations

On the basis of our largely conceptual analysis in this report we make the following general recommendations:

Measurement of Underemployment

Empirical studies should be carried out to identify causes and magnitudes of underemployment. Data bases such as Project TALENT appear to provide the best source for quantifying a number of the issues raised in the present report. Experimentation with these data to identify underemployment is a logical "first step." With current data, key problems in the measurement of underemployment can be

identified. This information would be required prior to the creation of similar but more comprehensive data bases.

Occupational Clusters

Currently, our knowledge of links between occupations is limited. We suggest that more intensive efforts be made to identify occupation or skill clusters. These clusters can be identified by tracing the mobility of workers between occupations. Information from this source would assist in identifying the most flexible types of skills and education. The more flexible a particular skill the less likely that underemployment will occur.

Labor Market Information

In order to improve labor market information in general, we recommend that manpower forecasting be improved; in addition, that current labor market information be disseminated through an improved employment service and by better cooperation between educators and those responsible for manpower planning. These are general suggestions; however, improvements along these lines will result in a more efficient use of human resources. Assuming that labor market information is adequate, more research is still required in order to understand how students make education and career choices.

Hiring and Promotion Process

In our chapter on causes of underemployment we suggested that the hiring and promotion process is a major point in the labor market where underemployment may begin. Empirical evidence is wholely inadequate

in this area for policymaking purposes. We strongly recommend that more research be done within this important and neglected aspect of the labor market. Education will clearly be underutilized if unequal treatment is experiences at the hiring door, whether this unequal treatment is statisical or prejudicial.

Education, Ability, and On-the-Job Training

Years of education is an insufficient measure of skill level. More information is required to identify the effects of formal education, ability, and on-the-job training on earning and employment outcomes. These variables are not additive, rather it is expected that they interact in a multiplicative way. Sorting out the interaction effects of these variables would assist in more accurate calculations of rates of return to human capital investment in formal education.

Education-Oriented Recommendations

This study has been concerned mainly with conceptual issues related to the problem of underemployment of human resources. Although numerous possible sources of underemployment have been identified, we have not been able to empirically determine the relative magnitudes of the various causes. The absence of quantitative measures of underemployment has led us to make the empirically oriented recommendations provided above. Below we make some additional suggestions for policy makers in the field of education. While these recommendations are not based on empirical analysis, it is reasonable to expect that action taken on these suggestions would reduce underemployment as it has been defined in this study.

Responsiveness of the Education System to the Labor Market

The education system can foster underemployment by training too many people for particular occupations, given the current stock of workers and the flow of individuals into those occupations. The difficulties of forecasting manpower demand and supply are significant; however, there is considerable room for improvement in the design of education programs which are responsive to changes in the labor market. Coordination between manpower officials, educators, and industry at the local level is particularly inadequate. Given the trend toward decentralization, state and local areas will have to take on additional responsibility and accountability for educational program development. Consideration should be given to the development of local area planning models such as LEMPS (Local Education and Manpower Planning System).[5] Under a model like LEMPS, local high school vocational program planners would cooperate with manpower officials and regional employers with one major goal being to make education programs more responsive to the labor market. The model promotes more efficient and comprehensive planning as well as encouraging planners to consider alternative programs and to assess the relative merits and costs of the alternatives. Together, educators, employers, and manpower representatives (1) develop and integrate information on the stock and flow of potential students and jobs in the area; (2)

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[5]The authors are currently involved in the development of the LEMPS concept at the Institute for Research on Human Resources at The Pennsylvania State University.

design alternative programs that could be useful in light of labor market demand and supply conditions; (3) identify the skills that various target groups might obtain under the alternatives; and (4) develop a system of follow-up studies to monitor the earnings and employment experience of program graduates. Clearly, this type of cooperative, comprehensive planning would require extensive experimentation and time to develop, but the limited supply of public dollars dictates that educators begin to think in terms of inputs, processes, products, impacts, and costs of their programs. This approach could be expected to serve not only the planners themselves, but more importantly, students would be better suited on average to the local labor market that they will likely enter. Other factors the same, this type of planning effort will reduce underemployment.

Flexible Skills

One of the causes of underemployment identified in this study is inadequate transferability of skills. In part, overspecialization in vocational education programs may contribute to the problem. Clearly, there is a need for specialization in education; the question is how much specialization and when? It is preferable to be trained as an automobile mechanic or as a more general mechanic? Probably the latter, as further specialization can be picked up in the work place, while broader skills enhance mobility. Consideration should be given to wider adoption of education in occupational clusters. We endorse the occupational cluster approach to education suggested by

the U. S. Office of Education.[6] Under this proposal, students would be exposed to 15 broad occupational clusters at an early age; in junior high school, students would select a few clusters for more detailed study. By the end of grade nine, students would select one area for intensive study. The approach is designed to allow useful occupational concentration without counter-productive overspecialization. The student is equipped with a marketable skill and qualified for a number of entry-level positions in his chosen field. The flexibility in skill resulting from this type of educational approach can be expected to reduce the probability of underemployment.

Counseling

In this study we have identified inadequate information at various points in the labor market as a probable cause of underemployment. Enlightened counseling services provided when education and training take place can be expected to reduce underemployment, particularly for those students who do not have strong informal contacts with the labor market through family and other personal acquaintances. Enlightened counseling would be responsive to students' abilities and labor market conditions.

The real effect of counseling on students' labor market success is not well understood. Although it is reasonable to expect that

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[6] See Kenneth B. Hoyt, et al. Career Education: What It Is and How To Do It (Salt Lake City: Olympus Publishing Company), pp. 62-64 and 85-95.

improved labor market information and dissemination, combined with improved counseling, would result in better occupational and educational choice, young people may simply have to learn by "doing." That is, they may have to experience work to really learn about work. In addition, family background and peers may be the "real" factors which influence choice of education and occupation. Much more study is needed to identify how career choices are made. Traditional counseling might better be replaced by "counseling in the classroom." This would commence in the early years, and a major objective would be to improve students' judgment and general awareness of work alternatives. Rather than suggesting what programs students should pursue, it might be more effective to prepare students to make their own choices in a more rational manner. This view would suggest improved labor market information and dissemination, coupled with an attempt to instill good judgment in students, in preference to traditional counseling. Exploration of the role of counseling and what form it should take represents a significant research need related to the underemployment issue.

Nontraditional Education for Women

The labor force participation rate of women is expected to continue its rise in the foreseeable future. The range of curricula and job opportunities open to women is unnecessarily narrow, the result being a greater probability of underemployment for women than for men. Although expanded job opportunities for women will assist in alleviating the problem, an important complementary step is increasing the range of educational choice for women. More emphasis

should be placed on developing nontraditional careers for women. Many education and training programs that are currently institutionalized as "male" programs should encourage female participation.[7] Expansion of opportunities along these lines could reduce underemployment in two ways: (1) by cutting down on occupational overcrowding, and (2) by removing psychological barriers to occupational attainment.

Lifetime Availability of Education

Consideration should be given to improving lifelong access to education and to the integration of it into a pattern of career education. Recurrent education, as developed by the Center for Educational Research and Innovation,[8] comments on recurrent education as follows:

> The essence of the recurrent education proposition...is the distribution of education over the lifespan of the individual in a recurring way. This means a break with the present practice of a long, uninterrupted pre-work period of full-time schooling, which has been described as a "front-end model."[9]

This promising departure from traditional education would make youth-centered education just one alternative in a system of publicly recognized

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[7] Jacob J. Kaufman and Morgan V. Lewis of the Institute for Research on Human Resources at the Pennsylvania State University are currently conducting a study for the U. S. Office of Education on nontraditional education for women.

[8] Center for Education and Innovation, Recurrent Education: A Strategy for Lifelong Learning (Paris: Organization for Economic Cooperation and Development, 1973).

[9] Ibid., p. 7.

and publicly subsidized work-free periods of education that individuals could have access to at any age. The separation of education from work, leisure, and retirement is artificial. The compartmentalized view of "education first, other activities later," is left over from an era when education's primary role was that of the provider of basic functional skills. The labor market experience of individuals was their own responsibility. Clearly, individuals must take the primary responsibility for their own future; however, lifelong access to education can be expected to help prevent individuals from becoming locked into occupations where they are underemployed due to demand and supply conditions in the labor market.

In the United States and in other countries, it took society many years to realize that individuals can fall into unemployment as unwilling victims; the Great Depression made this fact an obvious one. With the Full Employment Act of 1946, the federal government took major responsibility for preventing unemployment, a condition no longer deemed simply to be reflective of inadequacy of individual motivation. In the same way, underemployment may result from factors beyond individuals' control. Inadequate transferability of skills because of limited options for mid-career education and training is one barrier that can turn transitional underemployment into a permanent condition. The development of education as a lifelong process would work toward removing this barrier. Improved lifelong access to education could reduce macro-underemployment by easing transfers between occupations; it could reduce micro-underemployment by certifying persons for jobs for which credentialism would otherwise have disqualified them.

On-the-Job Training

An important source of education is on-the-job training (OJT); it is provided in a myriad of forms from simple work experience to highly formalized training. The result of OJT may largely be to socialize new hires to a particular orgainzation and its method of operation and/or it may impart real skill attributes to prepare workers for vertical job mobility. One negative aspect of OJT as education is that it may be very specific and uncertified; therefore, it may be less transferable than in-school training.[10] The most obvious positive characteristic of OJT relative to formal education is that the former provides a learning experience at the work place and, therefore, other factors the same, the probability that a worker will end up working in the area of his training is increased.

Education policy makers should not restrict themselves to thinking in terms of programs as being either formal or OJT; rather there is a need to look more closely at the effectiveness and cost of cooperative or work experience education programs. More information is required on how formal education and OJT interact. That is, what types of formal education lead to particular types of OJT and how does this interaction influence earnings and employment outcomes which may be wrongly attributed to formal education alone? Inadequate knowledge of this important interaction represents a significant problem in calculating rates of return to human capital investment in formal education.

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[10] Firms are not so interested in providing general skills; rather, they desire to impart skills to workers that can be directly applied to a particular task in that firm. In fact, it is in the interest of the firm to provide skills which cannot easily be transferred.

Part-time Work

Part-time work opportunities have been increasing rapidly since World War II. Flexible work scheduling for employees on an experimental basis is becoming more popular. However, most jobs still require the employee to work the standard work week. The part-time labor market is restricted largely to unskilled jobs. The result is that skilled or professionally trained individuals who take part-time jobs by necessity or desire have a high probability of being underemployed. Women with family duties, older workers, and the handicapped could all benefit from innovative efforts to provide professional jobs on a part-time basis. Both private and public employers should consider the merits of flexible and part-time work schedules so that they might take advantage of underutilized professionals who are currently in the labor force or who are not now in the labor force because of limited work opportunities in jobs with flexible work schedules or possibilities for part-time work. More enlightened work scheduling would reduce underemployment for many and provide more satisfying jobs in the part-time labor market. In addition, the provision of high quality part-time work would prevent part-time workers' professional skills from eroding through lack of use.

The maintenance of inflexible schedules in many instances simply may be the result of institutionalization of myths regarding the lower costs and necessity of a standard work schedule. There may be significant costs attached to the provision of professional part-time jobs and to flexible work schedules; the costs and

benefits of alternatives should be investigated in order to give empirical credibility to the notions that abound in this area.

Paraprofessionalism

Paraprofessionals normally work under the supervision of professionals and perform tasks formerly reserved for the latter. An innovative expansion of paraprofessionalism could be expected to reduce underemployment in two ways: (1) upper level professionals would be permitted to spend additional time performing tasks which more closely reflect their particular expertise; they would be relieved of many duties which can just as effectively be performed by other less highly qualified professionals; (2) persons capable of providing many professional services but who are prevented from doing so by rigid work rules or nonexistent job slots, leave underemployment behind when paraprofessional jobs are created to utilize their skills. A successful paraprofessional program would harness the concept of continuing education or recurrent education and on-the-job training to create more flexible career ladders for those individuals who cannot or do not take the normal professional education paths. The advancement of paraprofessionals to full professional status would call for action by the professions themselves, the education system, and government. Government would have to modify its licensing and certification practices. Education institutions would have to cooperate with the professions to identify or define professional skills. The professions would have to be willing to integrate paraprofessionals into the work place and to accept paraprofessionals as potentially full colleagues. Consideration should be given to the further development of this avenue for reducing underemployment.

Level of Education

Given the numerous possible sources of underemployment that we have identified in this paper, we are led to the conclusion that underemployment of human resources is a significant current problem, a problem worthy of considerably more research. Given the rapid increase in educational attainment that outstrips increases in technical requirements of jobs, the prospect is for more rather than less underemployment in the future. There is some attractiveness to the response that we should simply reduce the amount of education and training in general to prevent the "wastage" of skills. This policy, however, would run counter to the known long-run effects of education on economic output, to the possible upward mobility of individuals, to distributive justice for socioeconomic groups just now giving equal access to education, and to the nonemployment benefits that education imparts to society.

Rather than reduce the overall level of education, we would suggest a more responsive educational system, one which is able to point out to students, young and old, which areas of study will be useful for jobs as opposed to those areas which, while providing for stimulating consumption of education, are not likely to be very good investments in the labor market. Exploring new innovative approaches to education and recurrent education and being responsive to labor market changes could well negate any need for, or the desirability of reducing the overall level of education.

APPENDIX A

Project TALENT*

Overview

Project TALENT is a large-scale, long-term educational research study which is both longitudinal and cross-sectional in its methodology and implications. It is longitudinal in that tested subjects are followed up aperiodically; it is cross-sectional in that the longitudinal data are available for four successive grade groups, 12, 11, 10, and 9. The overall goal of Project TALENT is to understand the nature and development of the talents of America's young men and women. Within this broad context, Project TALENT has had the following specific goals:

1. To obtain a national inventory of human resources.
2. To develop a set of standards for educational and psychological measurements.
3. To provide a comprehensive counseling guide indicating the patterns of aptitude and ability which are predictive of success and satisfaction in various careers.
4. To formulate a better understanding of how young people choose and develop in their life work.

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*This section comes directly from: The Project TALENT Data Bank: A Handbook, Project Talent, American Institute for Research, Palo Alto, California, 1972, p. 144.

5. To identify the educational and life experiences which better prepare students for their life work.

To achieve these goals, the initial phase of Project TALENT consisted in giving a very large and representative sample of high school students a comprehensive battery of paper-and-pencil tests and inventories. That was in 1960. It was planned that members of the sample would then be followed up periodically by questionnaires over a 20 year span. Thus Project TALENT constitutes the first large-scale, long-range longitudinal study of a representative sample of students assessed with a comprehensive set of psychological, educational, and personal measures.

The overall design of Project TALENT provided for follow-ups approximately one, five, ten, and twenty years after each of the four classes was expected to graduate from high school. The one-year and five-year follow-ups have been completed, and first phase of the now eleven-year follow-up is in progress at the time of the preparation of this handbook. [Note: Two of the eleven-year follow-ups are now complete.]

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